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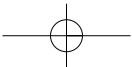
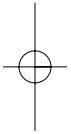
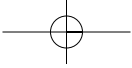
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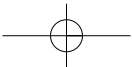
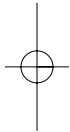
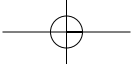
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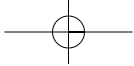
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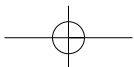
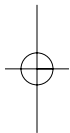
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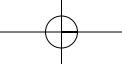




**Extending Telecoms Ownership in South Africa:
Policy, Performance and Future Options**

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University of Cape Town





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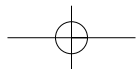
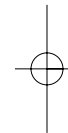
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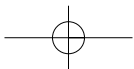
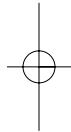
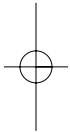
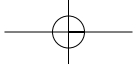
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ACRONYMS

AMPS	All Media and Products Survey
BT	British Telecommunications
CPI	Consumer Price Index
DoC	Department of Communications
GDP	Gross Domestic Product
ICASA	Independent Communications Authority of South Africa
IES	Income and Expenditure Survey
ITU	International Telecommunication Union
JEDP	Joint Economic Development Plans
LFS	Labour Force Survey
OECD	Organisation for Economic Co-operation and Development
OFTEL	Office of Telecommunications (UK Regulator)
OHS	October Household Survey
PSTN	Public Switched Telecommunications Network
PSTS	Public Switched Telecommunications Service
SA	South Africa
SAARF	South African Advertising Research Foundation
SIM	Security Identity Module (cellphone usage)
SME	Small and Medium-sized Enterprises
SMS	Short Message Service
SNO	Second Network Operator
USA	Universal Service Agency
USF	Universal Service Fund
VANS	Value-Added Network Service
VoIP	Voice over Internet Protocol
WTO	World Trade Organisation



Extending Telecoms Ownership in South Africa: Policy, Performance and Future Options

EXECUTIVE SUMMARY

The reform of the telecommunications sector in the mid-1990s had as one of its areas of focus an expansion of access to telecommunications – both at household ownership and broader access levels.

This paper examines the performance of policies around ownership and suggests alternative options for the future.

It finds that despite the large roll-out programme in fixed-line telecommunications, there has been only very limited gains for rural and low-income users. Although Telkom's exclusivity period initially caused an acceleration of the growth in net new lines from Telkom's greater investment levels, this acceleration only lasted until 2000/1 when Telkom started to enforce timely accounts payment more strictly. This precipitated an actual decrease in the total number of active lines in 2001 and 2002 despite new lines being rolled out. Household figures suggest that low-income households disconnected in large numbers.

This reflects the fact that people who could not afford phones were given access, but later disconnected. The end result was that fixed lines ended up growing at a similar rate to what they were prior to the exclusivity period – suggesting that the grand subsidisation of universal access was most likely a waste of resources and only resulted in temporary ownership improvements.

Another problem government now faces is the number of people who have disconnected from Telkom and remain indebted to the company. These households are prevented from getting a fixed-line phone until they repay their debt. It further has potentially far-reaching effects on their lives through destroying their credit rating.

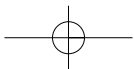
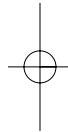
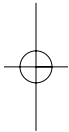
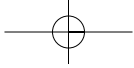
In contrast to fixed line, the growth in cellular subscribers has gone beyond all expectations. Almost all the gains in ownership have come from the adoption of cellular by rural and low-income users. This paper demonstrates that cellular is the rational choice for most low-income consumers given the different tariff structures and the average monthly spend on communication.

The paper further suggests that any future use of universal service funds should be more technology neutral, which would enhance the role of cellular telecommunications in such plans. Taking the burden off fixed line for universal service provision may enable the acceleration of telecoms liberalisation in SA.

Obvious benefits are the better prices and products for business users. Fixed line remains the core application for business users who require bandwidth for data services and make considerably more calls than residential users, making fixed line the cheaper technology. Also, one of the current biggest users are cellular network operators. Improving prices on leasing and interconnection should lower cellular call rates, making it even more attractive to low-income users.

Another indirect benefit of doing away with the emphasis on fixed-line universal services is that the removal of specific SNO roll-out targets might help to stimulate more interest in this licence's bidding.

Finally, the new International Telecommunication Union definitions for universal access and service incorporate cellular technology and move away from a fixed-line focus. The thrust of these definitions is very much in line with the results displayed for South Africa.



Extending Telecoms Ownership in South Africa: Policy, Performance and Future Options

1. INTRODUCTION

A primary goal of the partial privatisation and liberalisation of the South African (SA) telecommunications sector has been to increase access to the communications infrastructure through boosting investment in the sector, addressing the imbalance in infrastructure provision, and improving efficiency. This was not the only objective¹, but it has played a significant role in defining the liberalisation path chosen in SA. In particular, it has been used to justify the five-year exclusivity period offered to the incumbent Telkom and has shaped Telkom's behaviour during this period by establishing roll-out targets in the licence. It has also been a consideration in the licensing of the cellular operators, requiring them to provide broad geographical coverage and install community payphones. Access continues to be a factor in shaping the industry after these roll-outs are complete, through the regulation of prices and the Universal Service Agency (USA). Access as a concept is broader than ownership and includes putting in place easily accessible telecommunications points outside the actual home that households can use. Hence the emphasis within the exclusivity period and the licence obligations is on both ownership of lines in the home (for fixed line only) and payphones for access (for fixed line and cellular).

The initial phase of universal service policy has ended with the conclusion of the exclusivity period for fixed line. The next step in the process is for all network operators to contribute a portion of their annual revenues to a Universal Service Fund (USF) that will be used to drive improvements in access. In addition, a second network operator (SNO) is about to be licensed and will no doubt be given certain universal service obligations in its licence agreement. It is timely that the success of the current policy is assessed, since it could hold some important lessons for the future spending of the USF, for SNO licence obligations, or for future entrants.

The purpose of this paper is to examine only one component of the universal access policy – expanding residential ownership of telephones (fixed or cellular). It acknowledges that ownership is only one part of universal access, and may not even be the most important part at this stage. However improving access rather than household ownership is a short-term goal that should eventually give way to universal service (that is, ownership) as the gross domestic product (GDP) per capita improves and SA is better able to support that social objective. Therefore it is also useful to examine ownership policies.

The paper is structured as follows. Section One reviews the universal access policies that were introduced with the reform of the telecoms sector in the mid-1990s. With this context in place, Section Two examines changes in household ownership

¹ Other, often competing, objectives have included: the need to raise money from the sale of state assets; the need to improve the product range, quality and price to help boost the competitiveness of the broader economy; and a means to further black economic empowerment.

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The initial phase of universal service policy has come to an end with the conclusion of the exclusivity period for fixed line.

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since 1995, with a specific focus on the period 1997-2002. This was Telkom's exclusivity period but also the start of cellular growth with the introduction of prepaid in November 1996. Section Three does a cost comparison of cellular and fixed-line technology for low-income SA consumers to determine technology choice and affordability. Section Four takes the lessons from the performance of the previous policy and the consumer choice assessment and examines possible changes in the future direction of universal service policy. Finally some concluding remarks are made.

The paper makes use of data from the October Household Survey (OHS) – now called the Labour Force Survey (LFS) – the All Media and Products Survey (AMPS), the Income and Expenditure Survey (IES), and a small survey done by the author in the low-income areas of Cape Town. The first three surveys are based on true samples of the SA population and provide the core data on access and affordability. The author's survey was not designed to be representative but rather to get a better feel for the choices made by low-income households between fixed-line and cellular means of access. It surveyed 50 households with the following selection criteria: (a) residency in the low-income areas of Cape Town and (b) ownership of either a cellular or fixed-line phone (but not both). Details on these data sources and the questionnaire used in the author's survey appear in the Appendix.

2. POLICY APPROACH TO EXTENDING TELECOMS OWNERSHIP DURING THE REFORM OF THE 1990S

Universal service has two components – ownership and access. Ownership is specifically about getting households to own a phone in the home. Access is broader and entails households having a working phone within reasonable walking distance from the home. Universal service policy in SA has focused on three instruments – licence obligations, price regulation and the USF.

2.1 Licence Obligations

2.1.1 Fixed line

The achievement of social objectives played an important role in deciding how to regulate the fixed-line market. It was felt that rapid infrastructure roll-out to previously under-serviced areas was critical to the promotion of universal service and economic empowerment. As these are generally either low-income or rural areas, it was argued that immediate competition in fixed-line services would not best serve the objectives since:

It was felt that rapid infrastructure rollout to previously under-serviced areas was critical to the promotion of universal service and economic empowerment.

Extending Telecoms Ownership in South Africa: Policy, Performance and Future Options

- New entrants would target the more lucrative and easily established business and long-distance markets first and not seek to roll out in under-serviced areas.
- Competition in these markets would squeeze the profitability of Telkom and so limit its ability to roll out in unprofitable areas.
- The option of contributions to a USF was not desirable until basic exchange infrastructure was in place in areas where low-income households could be more cheaply connected.

This coincided with the need to restructure Telkom to face competition through improving efficiency, rebalancing its tariffs to remove cross-subsidisation, and bringing down its debt. Internally, it was also felt that the granting of an exclusivity period helped to raise Telkom's market value, allowing for a better price on the equity sale. For these reasons the Telecommunications Act gave Telkom a regulated monopoly for five years from May 1997 in public switched telecommunications network, national long distance, international, local access and public payphones, as well as infrastructure for value-added network services (VANS), mobile cellular network operators and private networks (other than Transnet and Eskom).

However to ensure that the exclusivity period fulfilled the goals of infrastructure roll-out and prepared Telkom for competition, strict licence conditions were imposed on the network provider, including rolling out 2.81-million new lines over the exclusivity period of which two-thirds would be in under-serviced areas and for priority customers. It was estimated that this would require capital investment of about R53-billion. The specific roll-out targets are presented in Table 1 below.

Table 1: Roll-out targets for Telkom in terms of its licence

	1997/8	1998/9	1999/2000	2001	2002	Total
Total new access lines brought into service	340,000	435,000	575,000	675,000	665,000	2,690,000
No. in under-serviced areas	265,000	318,000	359,000	357,000	378,000	1,677,000
No. for priority customers	3,240	3,845	4,055	5,060	4,046	20,246
No. of villages served	510	610	610	800	644	3,174
No. of payphones	20,000	25,000	25,000	25,000	25,000	120,000
No. of replacement lines	20,000	13,000	65,000	551,000	603,000	1,252,000

[Source: Joint Economic Development Plans (JEDP)]

Telkom's licence conditions included rolling out 2.81-million new lines over the exclusivity period, of which 2/3rds would be in under-serviced areas and for priority customers.

Table 1
Roll-out targets for Telkom in terms of its licence

Extending Telecoms Ownership in South Africa: Policy, Performance and Future Options

There are financial penalties for failing to reach these targets. Telkom pays R450 per line for the first 100,000 lines and R900 per line for each extra line missed. If it misses priority customer targets, the penalty per unit is R4,500, for schools R900, public payphones R2,250 and villages R1,125.

In addition to these roll-out targets, Telkom is committed to upgrading the network and its service record. This involves upgrading the entire network to digital by 2000, reducing the waiting period for installation and the time to fix faults, and lowering the number of faults per 100 lines.

2.1.2 Cellular

In 1994, MTN and Vodacom were granted cellular telephony licences. Cell C joined them in October 2001 after a protracted legal battle waged by one of the losing bidders for the third licence. The licences also imposed certain economic development and social service targets for the licence holders:

- MTN and Vodacom were required to install 7,500 and 22,000 community service telephones respectively to under-serviced areas over a period of five years. Given the ease with which this was achieved and exceeded, Cell C has been set the target of 52,000 over seven years.
- MTN and Vodacom were required to achieve population coverage of 60% within two years and 70% within four years. Cell C was initially allowed to roam on the Vodacom network, but was also set targets of covering 60% of the population on its own network within five years.
- Minimum levels of investment over a pre-determined period.

The cellular licence holders are not allowed to provide long-distance or international services, but must use Telkom and in future the SNO or state-owned signal carrier Sentech. They are free to negotiate international roaming services for when the consumer is out of the country.

2.1.3 Universal service 'spend' from these sources

Examining the cost of licence obligations is difficult because the companies do not make explicit reference to such costs. However one can form a rough idea of their expenditure. The starting point for such a 'back-of-the-envelope' type exercise might be to ignore any potential costs to the cellular networks. The obligations for these companies consisted of a population coverage requirement and limited pay-phones. Since population coverage in the networks exceeds the requirements under the licence obligations (for example, MTN's population coverage is 92% while its

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obligation is 70%), it was clearly profitable to extend such coverage, making none of it 'subsidised'. The payphone requirement was relatively insignificant for the initial cellular operators, but more onerous for Cell C. However as the Office of Telecommunications (OFTEL), the UK regulator, noted in its review of British Telecommunications' (BT's) universal service obligations, the advertising gain alone from payphones could make it a profitable exercise.

For Telkom, the roll-out obligations were more widespread and focussed on under-served areas. Telkom claims to have invested R48bn on infrastructure during the licence period (*Telkom Annual Reports, 1997-2002*). But not all of this was on under-served delivery and included digitalisation of the existing infrastructure and putting in place additional networks for advanced business services.² However in two of these years, Telkom's Annual Report makes explicit reference to what proportion of the capex was for under-served delivery: R2.58bn in the 1998/9 and R4.7bn in the 2000/1 financial years. Using the number of lines rolled out in each of these years, one can calculate the cost per line for Telkom – R7,550 in 1998/9 and R12,300 in 2000/1.³

Using the roll-out figures for other years and multiplying them by these costs per line (a conservative estimate using R7,550 for the first three and R12,300 for the last two years of roll-out), the total spend on universal access in under-served areas can be calculated as R17.8bn over the five-year period (or 37% of total capex). It is difficult to say what proportion of this might have happened anyway, especially since part of the roll-out was simply putting in place basic local-loop infrastructure. However since line growth has only been 25% of the number of new lines actually rolled out (*see Section 3*) and this is largely due to people disconnecting, it might be fair to say that a high proportion of new lines were rolled out to under-served areas that would not have obtained phones otherwise.

2.2 Price Regulation

Price regulation is a more indirect means of driving ownership in telecoms than access. This happens in two ways:

- The regulator aims to limit prices to cost plus a fair return to maximise demand/affordability for telephony whilst still providing an incentive to invest.
- The regulator can impose requirements on the firms to offer tariff structures more suitable to low-income consumers (the 'un-telephoned') in an attempt to get them to subscribe.

² This has large returns for Telkom as the data traffic component that requires digital lines is the high-growth component of group revenues.

³ One expects this escalation in costs from three factors: depreciation of the rand, inflation and a strategy of starting with the least-cost areas for rollout.

For Telkom, the roll-out obligations were more widespread and focussed on under-served areas. Telkom claims to have invested R48bn on infrastructure during the licence period.

2.2.1 Fixed line

National long distance and international long distance have declined in real terms to ensure compliance with the price cap of a 1.5% real decline in the basket.

The Telkom licence also allows for restrictions on price increases to ensure that its monopoly position is not abused during the exclusivity period. These are set for a bundle of services (including local, long-distance and international) and kept to the relatively lenient price cap of the Consumer Price Index (CPI) of 1.5% for the first three years, after which the Independent Communications Authority of SA (Icasa) will set tariffs.

In line with tariff rebalancing to face competition, Telkom adjusted the local call rates and connection fees upwards while bringing down national long-distance and international call rates. This rebalancing reflects the previous cross-subsidisation of local calls by international and long-distance services, but also Telkom's expectation that it is unlikely to face real local access competition from any other facilities-based competitor. As is evident from Table 2, the monthly rental, local call and mid-distance call rates all increased significantly in real terms since the beginning of the rate rebalancing in 1998. In contrast, national long distance and international long distance have declined in real terms to ensure compliance with the price cap of a 1.5% real decline in the basket.

In 2000, Telkom introduced a prepaid service aimed at low-income customers. The scheme aimed to attract these customers by putting together a low-usage rate scheme (lower initial connection and monthly charges but higher call rates) and making the package prepaid to reduce the need for credit checks as a pre-qualifier. To some extent this reflects the success of prepaid in the cellular market.

As a result of the incentives for Telkom to rebalance beyond what might be necessary to bring prices more in line with costs, there was a concern that the rebalancing may be excessive. Another concern was that this would most adversely affect the lowest-income groups and that excessive rebalancing might be detrimental to the alternative goals of improving access. In fact, Icasa noted in its review of telecoms tariffs (*Government Gazette 22240*) that residential users were possibly not sufficiently protected from price increases and proposed a separate residential price cap that would limit the increase of any single price to 5% per annum (active from 2002). Icasa also felt that Telkom's prepaid scheme did not go far enough to protect low-income users from rebalancing and proposed to jointly examine a way to improve the scheme.

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Table 2: Telkom year-on-year price changes (1998-2002): conventional postpaid residential service

	1998	1999	2000	2001	2002	Current price (2002)	Cumulative increase	Real cumulative increase
Connection charge		8%	0%	0%	15%	R239	24.2%	-1.2%
Monthly line rental	12.0%	11.0%	3.0%	9.5%	8.0%	R67.72	51.4%	16.8%
Local calls	25.6%	10.7%	10.5%	16.3%	-1.3%	R0.33 p/m	76.3%	41.7%
National (50-100km)	0.0%	9.8%	0.9%	1.8%	36.6%	R0.88 p/m	54.1%	19.4%
National calls (>100km)	-8.5%	1.8%	0.2%	-1.1%	-29.0%	R0.88 p/m	-34.4%	-69.1%
International calls	-5.4%	-7.5%	-11.6%					

[Source: Icasa, Telkom]

Table 3: Comparison of prepaid and postpaid fixed-line tariffs

	Postpaid service	Prepaid service	Prepaid as a % of postpaid
Connection charge	R239	R138	58%
Monthly line rental	R67.72	R41.97	62.0%
Local calls	R0.33 p/m	R0.38 p/m	114%
National calls (>50km)	R0.88 p/m	R1.04 p/m	119%

[Source: Telkom]

2.2.2 Cellular

Price increases were limited to the level of the CPI in any one-year period for the initial period, after which Icasa would set the rates. There has not been a significant focus on cellular and its price, partly because it might still be considered a luxury good, but also because it has been very successful in expanding telephony ownership among the poor through its prepaid package.

The major change in the cellular market was the November 1996 introduction of a prepaid service with tariff rates that suited a low-usage customer. This package suddenly made cellular phones more affordable to potential low-usage customers and

Table 2
Year-on-year price changes by Telkom (1998-2002): conventional post-paid residential service

Table 3
Comparison of prepaid and postpaid fixed-line tariffs

The major change in the cellular market was the introduction of a prepaid service in November 1996 with tariff rates that suited a low-usage customer.

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sparked the dramatic year-on-year increases in subscribers in SA.

Prepaid packages require subscribers to buy their own handset and a starter pack (Security Identity Module card or SIM card) that connects them to the network. Network providers have at various stages subsidised the handsets to lower the entry costs. To ensure that they benefit from the subsidy, the phones are either locked to that particular network and/or the handset can only be bought with a starter pack for that network. Currently phones cost anywhere from R400 upward and starter packs range from R105 (Cell C) to R150 (Vodacom).

There is no monthly charge to remain connected to the networks, but a minimum usage is usually required. This constraint has gradually been relaxed from having to activate a R30 call voucher every month to be able to receive calls to the point in 2002 where MTN only requires the subscriber to make one chargeable call every three months and Cell C only requires one to buy a R35 call voucher every six months. So, for as little as R0.95 per month on MTN or R5.83 on Cell C, a subscriber can be connected to the network and receive calls.

2.3 Universal Service Fund

The USF was established to subsidise “needy persons towards the cost of the provision to or the use by them of telecommunications services”, and to repay Telkom and other licence holders with universal service obligations for extending their services to poorly or un-served areas and communities. The Universal Service Agency administers the USF. For now, Telkom will receive most of the money as it rolls out to these areas. The fees are non-discriminatory and have been set by Icasa at 0.16% of turnover per annum for network providers, R1,500 per annum for VANS and R1,000 per annum for private networks. How these funds will be dispersed has yet to be decided and the USA recently put out a tender for consultants to help to devise such a strategy.

2.3.1 Universal service ‘spend’ from the USF

The annual contribution to the USF is the easier figure to determine and is predominately made up of the 0.16% USF tax on network providers. Revenues for this group in 2002 include: Telkom (excluding its Vodacom share) R27.3bn; Vodacom R13.4bn; MTN R9.9bn; and Cell C R1bn;⁴ providing total revenues of R51.6bn, which translates into a USF contribution of R83m. This can be expected to grow at a much faster pace than the economy given the rapid increase in mobile subscribers. Revenues in fixed line for Telkom grew by only 4% in 2001/2, while revenues for Vodacom grew by 25% and MTN by 26.8%. However the market for cellular phones is expected to begin to mature in the next few years, bringing about slower growth.

⁴ The Cell C figure is estimated from their number of subscribers * average revenue per subscriber.

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2.4 New Developments in Universal Service Policy

There are a number of noteworthy developments in universal service policy announced in the past year.

- Second national operator: The SNO will be given licence obligations around universal service.
- The 'fixed-mobile' licence: Both Telkom and the SNO are authorised to provide Public Switched Telecommunications Service (PSTS) in the form of 'fixed-mobile services', which constitute the use of wireless mobile technology within a restricted geographical area. This is not a cellular licence because of the restricted geographical mobility, but tries to exploit the latest developments in wireless technology to roll out the Public Switched Telecommunications Network (PSTN) cheaply.
- Small business competition for low-density areas: Small and medium-scale enterprises would be given licences to provide telecommunication services to areas with a teledensity of not more than 5%. These services include the use of Voice over Internet Protocol (VoIP), which is illegal for other operators to use.

3. TELEPHONY GROWTH AND HOUSEHOLD OWNERSHIP (1995-2001)

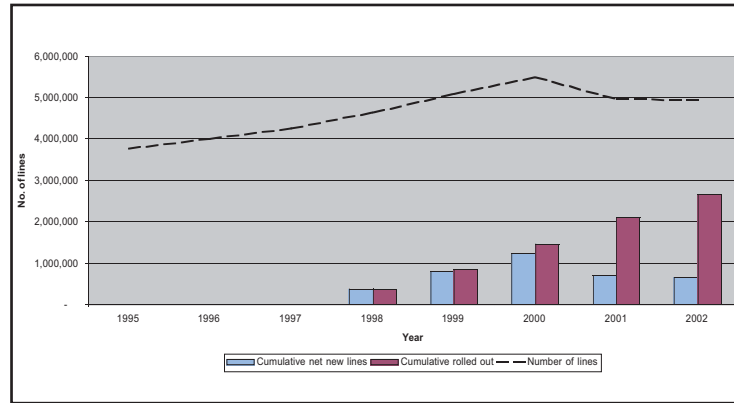
3.1 Line Growth and Penetration Rates

Since 1995, we have seen the explosion of cellular in SA and the big roll-out push from Telkom in the fixed-line component of the market. Figures 1 and 2 give the trends in line/subscriber growth in fixed and cellular markets.

Figure 1 looks at the fixed-line market, detailing the total number of active lines, the cumulative roll-out of new lines under the licence obligations, and the cumulative net additional new lines added to the total stock during this exclusivity period.

Figure 1
Fixed line: rollout of lines versus net growth in lines

Figure 1: Fixed line : roll-out of lines versus net growth in lines



[Source: Telkom annual reports 1996-2002]

The growth in cellular subscribers has gone beyond all expectations.

It is clear that the exclusivity period initially caused an acceleration of the growth in net new lines as Telkom incurred greater levels of investment. However this acceleration only lasted until the 2000/1 financial year when Telkom made a business decision to clamp down on bad debt and enforce the timely payment of accounts more strictly (*Telkom Annual Report 2001*). This precipitated an actual decrease of 530,000 in the total number of active lines in 2001 despite 630,000 new lines being rolled out (a total disconnection of 1,160,000 lines!). Similar policies in 2002 resulted in a more modest decline of 36,000 lines in total despite 570,000 new lines being rolled out (a total disconnection of 606,000 lines). Telkom has not released figures on whether the bulk of line disconnections were in the lower-income groups, but household figures (*see below*) suggest that low-income households did disconnect in large numbers.

There is always a degree of churn as people relocate or migrate to cellular, but the extent of churn in this case was astronomical. This largely reflected the fact that people who could not afford phones were given access, but later disconnected. The end result was that fixed lines ended up growing at a similar rate to what they were prior to the exclusivity period – again suggesting that the grand subsidisation of universal access in this case was most likely a waste of resources as it only resulted in temporary improvements in ownership.

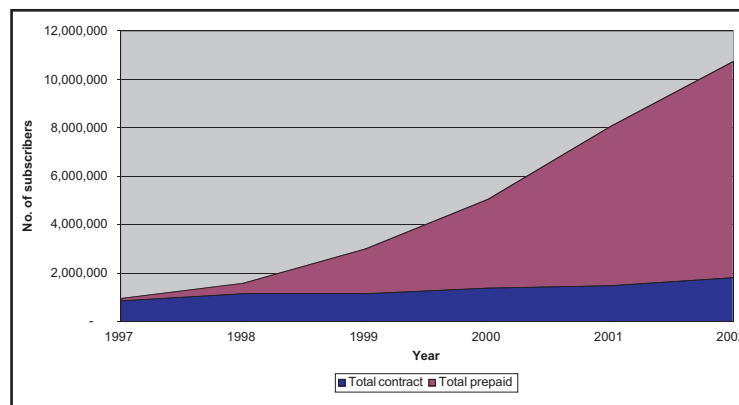
In contrast, the growth in cellular subscribers has gone beyond all expectations. Figure 2 below gives the total number of active⁵ subscribers by payment type (pre-paid or contract) for the period since 1997. Prepaid was introduced in November

⁵ It is important to differentiate between active and non-active subscribers as the numbers may differ considerably. Vodacom estimates that approximately 93% of their prepaid phones sold are active.

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1996 and it is clear that this offering is driving market growth. Prepaid now makes up about 83% of the estimated 10.8-million subscribers. Contract numbers have remained relatively flat, growing from around 850,000 in 1997 to 1.8-million in 2002, while prepaid has added roughly nine million new subscribers in that time period.

Figure 2: Number of active cellular subscribers: 1997-2002



[Source: Telkom Annual Reports, M-Cell Annual Reports, Business Day newspaper]

The most common and simplest means of assessing the level of telephone penetration in a country is to divide the number of telephone lines by the population (and multiply by 100) to get the number of main lines per 100 inhabitants. This provides a reasonable rule of thumb and is most likely highly correlated with actual levels of household access across countries.

However since a large proportion of those lines is in offices, and increasingly in households with two lines or in households with multiple cellular phones and a fixed line, this measure has become progressively poorer in predicting actual household ownership. For this reason it is important to use household survey data to get a true idea of how household ownership is changing. Before looking at the household data, it is useful to have a quick glance at the penetration rates.

Figure 3 looks at the penetration rates for fixed line, cellular and the two combined. To give an idea of how accurately the penetration measure can be used for predicting trends in ownership, the household penetration rate derived from the household survey data is included (*see next section*). It is apparent that while penetration is rising in total, it is all due to cellular. Fixed-line penetration rates have grown from

Figure 2
Number of active cellular subscribers: 1997-2002

Fixed-line penetration rates have grown from 10.33 at the onset of the exclusivity period in 1997 to only 10.95 in 2002. In contrast, cellular penetration rates have grown from 2.31 to 24.98 in the same period.

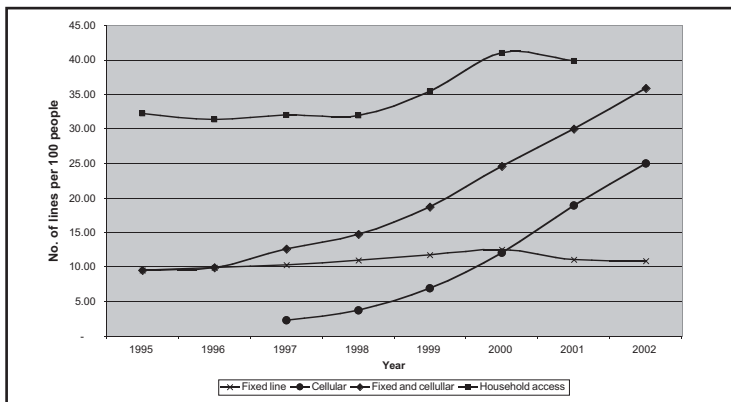
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10.33 at the onset of the exclusivity period in 1997 to only 10.95 in 2002. In contrast, cellular penetration rates have grown from 2.31 to 24.98 over the same period.

The comparison with household access is interesting. While penetration rates have roughly trebled in the period 1997-2002, household access has only improved by around 20% (from 32% to 40% of households). Further, while cellular drove the initial increase, access changes have been flat since 2000, reflecting the large number of disconnections in fixed line and the fact that households may be getting multiple phones. What is certain is that household data rather than penetration rates should be used to get a good idea of what is really happening to access.

Figure 3
Telephony penetration
in SA:1995-2002

Figure 3: Telephony penetration in SA: 1995-2002



[Source: Compiled from Statistics SA, Telkom Annual Reports, M-Cell Annual Reports, Business Day, OHS and AMPS]

3.2 Household Ownership (1995-2001)

Two sources of household data cover telephony – the Labour Force Survey (formerly the October Household Survey or OHS) from Statistics SA, and the All Media and Products Survey (AMPS), commissioned by the SA Advertising Research Forum (SAARF). Both cover the entire population, but the AMPS focuses on interviewing only over 16 year-olds (yet household data remains constant).

The preference for this paper is to use the AMPS dataset, since there are a number of problems related to communications with the LFS/OHS dataset. These are:

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- Income data is done on a per person level and income categories are used in all years, save 1995. This prevents aggregation to the household level and therefore any analysis of access by income group (a key issue).
- The fact that the 1999 questionnaire did not separate fixed line from cellular makes it impossible to determine household ownership of each separately.
- In the 2000 questionnaire, the data for cellular phone penetration is inaccurate because the previous question asks the household if it owns a Telkom phone, then directs the household to skip the “ownership of a cellular phone” and “minutes to the nearest phone” questions if the answer is yes. The result is that it only picks up those that only have a cellular phone and not both cellular and fixed line.
- Unavailability of the 2001 data is limiting, since this was a turning point in access as Telkom experienced a large rise in disconnections.

The AMPS data has far greater continuity and there are no obvious errors in the questionnaire, making it more attractive to use. In addition, it includes a question on work access, which is important. Unfortunately, data was only available from 1998, but at least there were figures for 2001. However the author was unable to get AMPS data for the period 1995-1997 in electronic format for further analysis and so the LFS/OHS data has been used for these years where applicable. Note that the use of two different data sources means there may be some apparent inconsistencies. However the trends are usually consistent and only AMPS data is used from 1998 onwards, making the analysis of the exclusivity period consistent.

3.2.1 Ownership of a home phone – fixed or cellular

Figure 4 details phone ownership at the household level from 1995 to 2001. It is clear that household penetration has increased over the period of telecoms reform in SA, from 32.27% of households in 1995 to 39.92% in 2001. However what is also apparent is that the source of this increase is due entirely to the adoption of cellular phones and not fixed line. In fact, fixed-line access rates (those with fixed line only and both a fixed line and cellular phone) have declined from 30.12% in 1995 to 28.73% in 2001. The number of phones may have increased, as noted above, but the number of households has increased at a faster rate. The penetration of fixed lines did increase with the initial roll-out from Telkom at the beginning of the exclusivity period (from 29.1% in 1997 to a peak of 31.73% in 2000), but the clampdown on bad debt resulted in a dramatic decline in access in 2001. Figures from AMPS for 2002 (not available at the time of writing) should confirm this trend. This spate of disconnections also caused overall penetration to decline from 41.02% of households in 2000 to just under 40% in 2001.

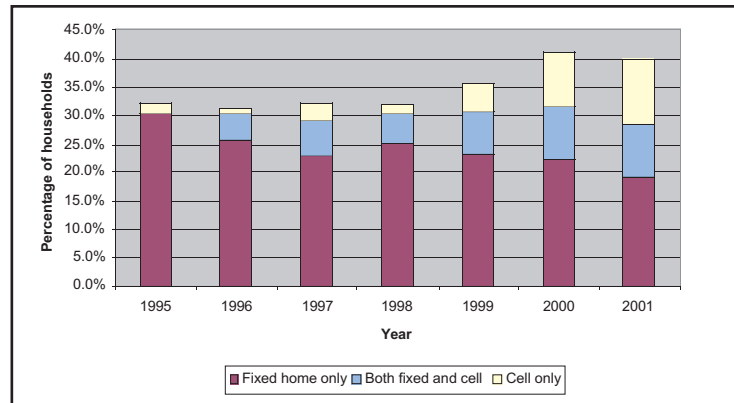
It is clear that household penetration has increased over the period of telecoms reform in SA, from 32.27% of households in 1995 to 39.92% in 2001.

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The expansion of household access has been due to the number of households getting a cellular phone only (ignoring those with both fixed line and cellular phone – generally the wealthier households that are already connected – *see below*). The proportion of households owning a cellular phone increased from 2.14% in 1995 to 20.73% in 2001. For 11.19% of households, the cellular phone was their only connection to the telephony networks, up from only 1.5% in 1998. It is therefore safe to argue that cellular – not fixed line – has been the success story of improved access in SA, despite the huge investments made in fixed line through the exclusivity period.

Figure 4
Household ownership
of phones: 1995-2001

Figure 4: Household ownership of phones: 1995-2001



[Source: OHS 1995-1997, AMPS 1998-2001]

However the focus of the universal access drive (at least the component focusing on household ownership) was to raise connectivity among low-income and rural households. Figure 5 examines the change in ownership by income group. It is clear that all income groups have improved their access since 1995. Again the question is what the source of such improvement was – fixed-line roll-out or cellular?

Figure 5: Household penetration by income group: 1995/2001

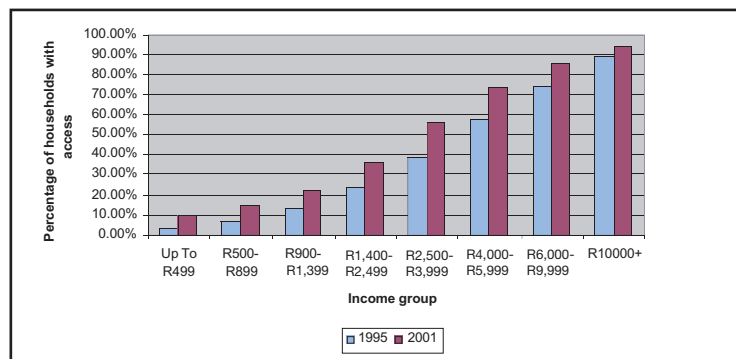


Figure 5
Household penetration
by income group:
1995/2001

[Source: OHS 1995, AMPS 2001]

A closer examination of the source of access growth for the four bottom-income groups in Table 4 reveals that for low-income households the main source of access growth has been cellular, and not fixed line.⁶ In fact, an increase in penetration by fixed-line technology only occurred in the R500-R899 income group. What is also interesting is the quite dramatic drop-off in fixed-line access for the R1,400-R2,499 income group. This group also adopted cellular technology at a more rapid rate than the rest and is still not in a high enough income group to adopt both fixed line and cellular. Ownership of both fixed and cellular increases to 8.9% for households earning R2,500-R3,999; 16.9% for households earning R4,000-R5,999; 27.2% for households earning R6,000-R9,999; and 47% for those earning more than R10,000 per month. From these figures it is apparent why cellular phones have been called complements to fixed lines in wealthier countries. However for lower-income groups in developing countries this definition clearly does not apply, given the low level of ownership of both.

⁶ Note: the exclusion of retired head of households did not make a material difference to the figures presented above.

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Table 4
Source of access for
different income
groups:
1998 and 2001

Table 4: Source of access for different income groups: 1998 and 2001

Household monthly income		Fixed line	Cellular	Both	Total access
Up to R499	1998	5.58%	0.11%	0.06%	5.63%
	2001	5.56%	4.94%	0.82%	9.67%
R500-R899	1998	7.00%	0.28%	0.17%	7.11%
	2001	9.39%	6.20%	0.90%	14.69%
R900-R1,399	1998	15.25%	0.45%	0.28%	15.43%
	2001	15.03%	9.27%	1.94%	22.36%
R1,400-R2,499	1998	31.27%	2.02%	1.01%	32.28%
	2001	23.62%	15.07%	3.18%	35.51%

[Source: AMPS 1998, 2001]

The trend is similar for rural households (Table 5 below): although there was an increase of almost 2% of households in fixed-line access, there was also an increase of 7.5% of households getting cellular, accounting for much of the increase in penetration from 4.77% to 13.18%. It is interesting to note that in urban areas a marked decline – from 49% to 43.5% – occurs in the portion of households with a fixed line, while cellular has grown by almost 200%.

Table 5
Source of access for
different locations:
1998 and 2001

Table 5: Source of access for different locations: 1998 and 2001

Location		Fixed line	Cellular	Both	Total access
Rural	1998	4.37%	1.27%	0.87%	4.77%
	2001	6.43%	8.84%	2.09%	13.18%
Urban	1998	49.12%	10.74%	8.43%	51.43%
	2001	43.47%	28.58%	14.46%	57.59%

[Source: AMPS 1998, 2001]

Finally, it is interesting to track changes in penetration and their source for different types of dwellings. The key issue is that certain dwelling types occupied by lower-income households may not lend themselves to ease of connection to a fixed-line network. In particular, the focus is on squatter homes, hostel dwellers, traditional houses and rooms in the backyards of other homes. Table 6 gives details of changes in penetration and the sources of such changes.

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While it is apparent that the extension of fixed line has met with some success in all but hostel dwellers, it is still clear that cellular has had far greater success in getting these households connected to the communications network. From the limited number of households that have both cellular and fixed line, it is also apparent that households see the two as substitutes and not complements.

Table 6: Source of access for different dwelling types: 1998 and 2001

Dwelling type		Fixed line	Cellular	Both	Total access
Traditional hut	1998	0.08%	0.00%	0.00%	0.08%
	2001	2.17%	3.80%	0.42%	5.55%
Squatter Hut	1998	2.56%	0.74%	0.00%	3.30%
	2001	5.46%	10.49%	1.13%	14.82%
Room in Backyard	1998	8.69%	0.80%	0.17%	9.32%
	2001	11.41%	18.01%	1.95%	27.47%
Hostel	1998	18.71%	1.73%	1.32%	19.12%
	2001	8.88%	22.38%	3.52%	27.74%

[Source: AMPS 1998, 2001]

3.2.2 Access to work phones

A different perspective on access to telephony that is almost never dealt with is access to a telephone at work. It must be remembered that a work phone does not provide a means of emergency communication from the house (often used as a justification for universal access) or a means of communication for other members of the household. However it does provide people with a communication device to which they are able to receive calls, separating it from payphones. Although the consumer is only available to receive calls on a work phone for part of the day, the same can be said of home phones. This at least satisfies the other reason for universal access – social interaction and remaining in contact with family and friends.

While we expect the inclusion of work phones to raise the level of household access, it is likely to be lower for low-income households whose members are either unemployed or have occupations where they are unlikely to have the use of a work phone. The data from the AMPS dataset concerns a fixed-line work phone. Households with access to a cellular work phone would be included in the general figures on cellular.

Table 6

Source of access for
different dwelling
types: 1998 and 2001

Although the consumer is only available to receive calls on a work phone for part of the day, the same can be said of home phones.

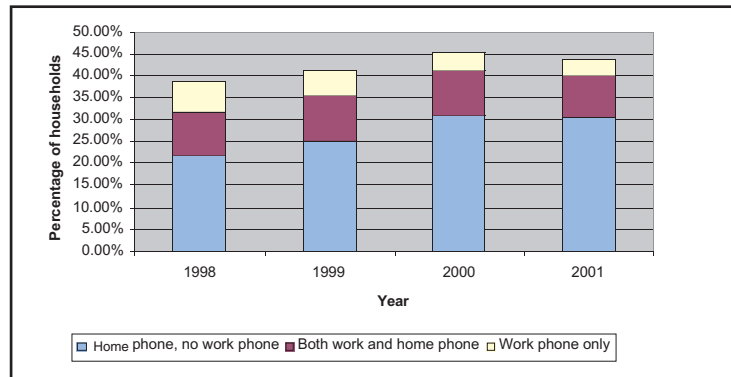


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Figure 6 reveals that the addition of a fixed-line work phone to the access criteria would lift the access figure in 2001 from 39.92% to 43.82%. What is also interesting is that there is a decline in the number of households with a phone at work – from 17.25% in 1998 to 13.16% in 2001. Is this a reflection of declining formal sector employment? Further, there is a drop in the proportion of households that have a work phone only – but this most likely reflects a mixture of increasing household access (shifting people into the category of having both a home and work phone) and declining work phones.

Figure 6
Household access
including work
phones: 1998-2001

Figure 6: Household access including work phones: 1998-2001



[Source: AMPS 1998,2001]

Table 7 below provides details of how the addition of work phones changes the degree of access for selected income groups, location and dwelling types. Although the proportion of households with a work phone is relatively small for these target groups (with the exception of the R1,400-R2,499 income group), a high proportion of these people with a work phone do not have a home telephone. This implies that the inclusion of a work phone into the definition of access has a significant effect on access measures for these groups. On average, it increases the access rate for each group between 18% and 33%. It also implies that a work phone may be a substitute for a home phone rather than a complement.

Table 7: Work phone by selected income group, location and dwelling type: 2001

	Up to R499	R500-R899	R900-R1,399	R1,400-R2,499	Rural	Traditional hut	Squatter hut
Work phone	3.1%	3.4%	5.5%	12.3%	4.9%	2.2%	5.8%
Proportion without a home phone	93.5%	79.4%	74.5%	51.2%	61.4%	85.0%	58.2%
% increase in access from inclusion of work phone	29.5%	18.6%	18.4%	17.9%	22.8%	33.7%	22.6%

[Source: AMPS 2001]

This section focused on the reform that has taken place in the telecoms sector in the past eight years and the drive for improved universal access that has been a feature of the policy. It also examined the resultant changes in household ownership of telephony – an important component of any universal access definition.

The results on ownership reveal that despite the huge investments made in fixed line during the exclusivity period, there has been a decline in fixed-line ownership at the household level since 1997 when the exclusivity period commenced. With an eye on universal access, this section examined how different target groups for universal access had been affected. Again the results show that for low-income groups, rural households and certain dwelling types, the penetration of fixed line has either remained constant or shown marginal increases. At the same time, there have been huge gains in access from the introduction of prepaid cellular telephony, dwarfing any gains from fixed line.

This result suggests two research questions, which is the subject of the next two sections: (a) why are these income groups going for cellular; and (b) what are the implications for universal access policy?

Table 7

Work phone by
selected income
group, location and
dwelling type: 2001

4. A COMPARISON OF FIXED AND CELLULAR TECHNOLOGY

The previous sections focused on understanding the reform environment for telecoms in SA and the changes in ownership that have taken place in the last eight years. It revealed quite clearly that increasing ownership at the low end of the market is due almost entirely to the adoption of cellular phones rather than any universal access drive in fixed line. The purpose of this section is to try to understand why that is happening. The section will examine two factors: (a) the affordability of each technology and its ability to penetrate the market; and (b) the choice between cellular and fixed line at the low end of the market. There is no examination of the choice at the upper end of the market because as incomes rise, cellular and fixed line increasingly become complements rather than substitutes and consumers tend to purchase both. The AMPS figures show that 47% of households earning over R10,000 per month have both a cellular and a home fixed line.

4.1 Telecoms Demand Models

The standard telecoms demand model acknowledges that access and usage are interdependent (Gassner 1998). Consumers need to be connected to the network before they are able to make a call (unless they use a payphone or somebody else's phone). Therefore one can model demand for access in a consumer surplus framework where demand is dependent on the benefit from usage of the network: does the price of access and usage exceed the benefits of usage? Given this structure, the consumer takes account of both access prices (installation cost and monthly exchange access) and the price of calls or usage (including local, national long distance and international long distance) when making the demand choice for access.

However the consumer also gets non-usage utility from access. As argued by Wenders (1987), the benefits from access should also include the surplus from receiving calls and the 'option value' of being able to make or receive calls. This results in an indirect utility function of the form:

$$u = u(\mathbf{p}_a, \mathbf{p}_u, y, \mathbf{z})$$

where \mathbf{p}_a is the vector of access prices, \mathbf{p}_u is the vector of usage prices, y is household income and \mathbf{z} is a vector of household characteristics that determines its preferences.

The consumer takes account of both any access prices (installation cost and monthly exchange access) and the price of calls or usage (including local, national long distance and international long distance) when making the demand choice for access.

4.2 Fixed-Cellular Comparison on Tariff Basis Only

At the simplest level, a comparison between fixed and cellular technology to the consumer can be based on price factors only. Both offer communication services whose utility can be measured from the number of minutes of communication bought. At another level, however, there are key product differences between cellular and fixed line that will offer differing utility to different consumers. It is also important to factor these into the equation when assessing technology choice.

Although there are a host of reasons why cellular may offer greater fixed utility to the consumer from being part of the network⁷, we can begin to explore the issue by focusing initially on cost only. The reasons are: (a) that the valuation of these differing features is difficult to measure empirically and so limits sensitivity testing; and (b) there is a strong likelihood that many low-income consumers make the technology decision purely on a cost basis. The latter point is supported by the results of the author's survey, examining technology choice among low-income households in Cape Town.

Respondents were asked whether they felt they were paying less or more for communication (including monthly and usage charges) given their choice of technology – cellular or fixed line. 86% felt that their choice of technology was the lower cost option given their usage pattern. The rate for cellular subscribers was 96% while that for fixed line was 77%. This discrepancy can be accounted for in part by inertia – fixed line was operating before cellular and many people simply remained connected after cellular was introduced. This hypothesis is supported by the fact that inertia was cited as the most important reason for choosing fixed-line communications among those with a fixed line (*see Section 4.3.3.1*). Further support for the hypothesis that costs drive the decision is that the average spend among cellular users was in a range consistent with choosing cellular to maximise communication usage (*see baseline results below*). Both these factors support the hypothesis that cost is the primary aspect driving the decision on which technology to use.

⁷ We have identified only one disutility – less received calls – which we can assume is outweighed by the positive utility effects for most (but not all) consumers.

4.2.1 The cost simulation model

The model determines the costs of telecoms consumption for the different phone options for a representative consumer. The total monthly costs can be represented as follows:

$$TMC_i = \mathbf{F}_i + q\mathbf{p}_i^r$$

where $\mathbf{p}_i^r = \mathbf{p}_i\mathbf{z}$

Total monthly costs for option i (TMC_i) depend on the vector of monthly fixed costs for option i (\mathbf{F}_i) and the quantity consumed q times the cost of a representative minute \mathbf{p}^r . The cost of a representative minute is a function of the vector of usage prices \mathbf{p}_i times the vector of usage pattern for the representative consumer \mathbf{z} .

The vector of fixed costs included for fixed line:

- Monthly annuity for the installation costs – period being the expected period a consumer resides in the same location.
- Monthly annuity for the cost of a handset – period being the expected life of the handset.
- Monthly access fee.

For cellular, the vector of fixed costs included:

- Monthly annuity for the cost of the starter pack – period being the expected period that a consumer remains on the same network.
- Monthly annuity for the cost of the handset – period being the expected life of the handset.
- Zero monthly fees because either there is no cost to being connected (e.g. in the case of MTN) or the requirement is a minimal purchase of airtime that is usually satisfied.

The vector of prices included:

- Local call prices differentiated by whether the call was on-net or off-net, in-peak or off-peak period.⁸
- National call prices differentiated by whether the call was on-net or off-net, in-peak or off-peak period.
- Short Message Service (SMS) rates.

⁸ Although in both fixed line and cellular there is a minimum charge of a full minute rate, there was no inclusion of call lengths because it did not alter the results significantly and added to the complexity of the model.

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This was matched to usage patterns where the following was defined:

- Portion of calls that are national (recognising that cellular calls are all national).
- Portion of calls made in peak period.
- Portion of calls made on-net – the author assumes a balanced calling pattern, that is, that the portion of calls to subscribers of different networks equals the market size of that network
- Portion of calls sufficiently small to be viable as an SMS (which means cellular users get this at an SMS rate).

There was no inclusion of international calls for simplification, as different destinations command different prices (although an average call price is a feasible option for inclusion, weighted or unweighted).

The options the SA consumer have are a fixed line, a prepaid fixed line, a prepaid cellular (three providers) and a postpaid cellular phone (three providers). The purpose of this model is to explore what type of home telephone service low-income consumers in SA will select if they have sufficient income to allocate to communication and get sufficient fixed utility from having a phone in the home. By making a number of simplifying assumptions, the problem can be reduced to one of a choice between prepaid fixed line and prepaid cellular.

Low-income households are low-usage consumers because of the limited amounts of income that they have available for consumption of communications services. As such, in both fixed line and cellular they will opt for low-usage schemes (the prepaid options). Data supports this assumption for cellular: not only are 79% of all cellular phone owners on the prepaid package, but the real take-off in cellular in SA followed the introduction of prepaid packages in November 1996. For fixed line, the prepaid option is relatively new but already Telkom has seen 705,500 subscribers (or 14% of total subscribers) take this option (either new subscribers or existing subscribers switching over). Anyway, the focus of this exercise is on current consumption choice and prepaid remains the cheaper option for low-usage consumers.⁹

For prepaid cellular, we can assume that the different networks essentially offer a homogeneous product and so we can select the cheapest prepaid package to use as the benchmark. In the period of study, Cell C offered the cheapest package.

We can assume that low-income consumers have insufficient income to afford both a cellular and a fixed line in the home (borne out by the data presented previously on ownership among lower income groups).

⁹ Tests on actual prices demonstrate that the point at which the conventional option becomes cheaper is for a monthly phone bill of R1328.68 (assuming that the user suffers no disutility from having to buy airtime and recharge the phone).

The options open to the consumer in SA are a fixed line, a prepaid fixed line, a prepaid cellular (three providers) and a postpaid cellular phone (three providers).

4.2.2 Key tariff structure differences

The key tariff structure differences between cellular and fixed line that drive the costing model are the relative differences in installation, fixed monthly access and usage prices.

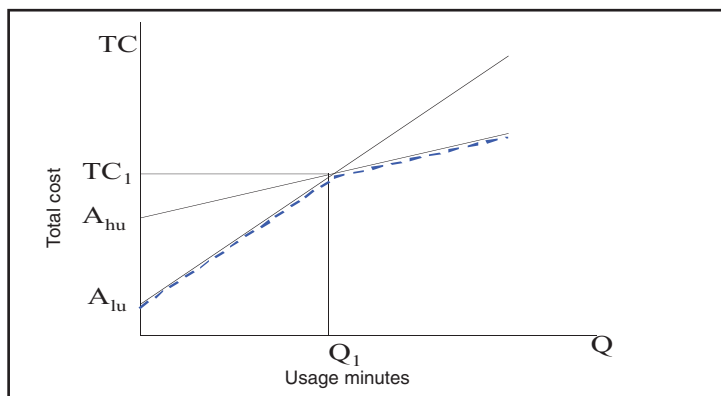
The key tariff structure differences between cellular and fixed line that drive the costing model are the relative differences in installation, fixed monthly access and usage prices. The key tariff differences are as follows:

- A higher installation fee for cellular: A phone and SIM card will cost from R500 upwards (excluding special offers¹⁰) while the installation charges for a fixed line are R138 for prepaid and R239 for the conventional service plus a phone (at as little as R60). However the installation fee is treated as an annuity and so its monthly impact is relatively small, making the higher installation fee for cellular less important than the fixed monthly fee for fixed line.
- A lower fixed monthly access fee for cellular: In fixed line the monthly access fee is substantial (for prepaid it is R41.97 and for conventional service R67.72). However for cellular it varies from as little as 87c on MTN (the minimum of one call at R2.60 per minute every three months to stay connected) to R5.83 for Cell C (one R35 call voucher every six months to stay connected).
- Higher call rates for cellular: Besides SMSs, call rates for fixed line range from 10% (local on-net call during off-peak times) to 80% (local off-net call during off-peak times) of that of cellular.

We expect the cellular phone to be cheaper for low usage because of its rate structure. However there is a point at which the higher usage rate structure will be cheaper and will continue to be cheaper beyond this point (*demonstrated in Figure 7 below*). A low usage rate structure has a low monthly access charge (A_{lu}) and a high call rate (slope of the function). This is cheaper than the high usage rate structure for all consumption of all quantities less than Q_1 , or equivalently, all spending of less than TC_1 . After this, the high usage rate structure is cheaper. The dashed line provides the dominant strategy for subscribers given their usage levels. So the purpose of the exercise is to determine this crossover point (the point fixed-line prepaid becomes cheaper than cellular) and contrast it to the expected communications spend of low-income households for a representative consumer. From this one can perform sensitivity tests on the assumptions.

¹⁰ For example, a recent special by Cell C on a Siemens phone effectively had the price of the phone and SIM card at R360. These offers invariably involve a phone that is network-locked to ensure that the company benefits from its subsidisation of the phone.

Figure 7: Comparison of low-usage and high-usage tariff structures



[Source: From Telkom and Cell C tariff information]

4.2.2.1 Why do these tariff differences exist?

It is important to note that both technologies differentiate between low-usage and high-usage customers. Cellular has contract (high usage) and prepaid options (low usage). Fixed line currently has three categories: the R7 call option (high usage option aimed at internet use), the conventional line and the prepaid line (low usage). The difference is that the low-usage option in cellular has an access charge close to zero while the lowest access charge in fixed line is R41.97 (with the exception of payphones, of course). Why does this difference exist?

Technological differences are the reason why cellular is able to offer this type of tariff structure and fixed line cannot. In fixed line, the costs involved in establishing the local loop and the last-mile drop to the home are predominately traffic-insensitive fixed costs – the actual wires (Caves 1999). However the marginal costs of making calls are practically zero once these fixed costs are covered. Ramsey pricing solutions to this type of technology suggest that a large part of the fixed costs should be recovered in the form of a fixed monthly fee. In the extreme, all costs should be recovered through the fixed monthly fee, as is the case in the US, where most packages offer free local calls for a fixed monthly fee. This strategy ensures that the fixed-line operator does not roll out to customers who do not spend a sufficient amount on communication each month and are unprofitable for the operator.

In contrast, cellular technology uses transmission stations to deliver the last-mile drop to the consumer. The nature of this technology is such that it is more traffic-

Figure 7
Comparison of low-usage and high-usage tariff structures

Ramsey pricing solutions to this type of technology suggest that a large part of the fixed costs should be recovered in the form of a fixed monthly fee.

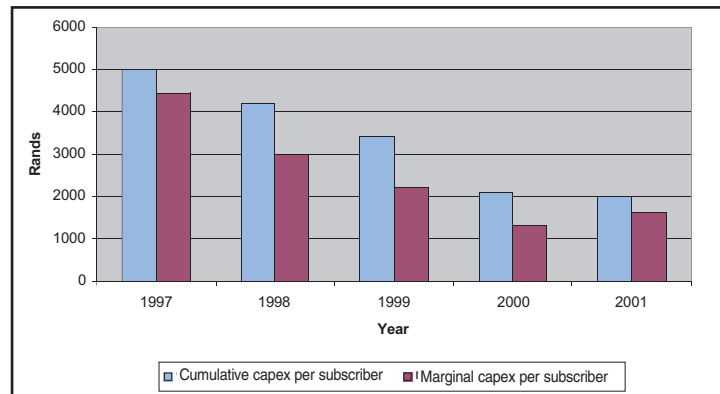
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sensitive, but not without a large fixed-cost element. Each transmission station has a limited capacity and so in the initial stages when there are a low number of subscribers, low investments in transmission are made and the geographic density of transmission stations is also low. The capex cost per subscriber will be large given the need for broad geographical coverage and limited subscribers. As the number of subscribers increases, so the density of transmission stations must rise to avoid congestion problems on the network. The result is that the addition of many low-usage customers to the network does not place a huge additional investment obligation on the cellular providers, because low-usage customers make few demands on the capacity of the network as they place few calls.

This is aptly illustrated by the marginal and cumulative capex per subscriber for MTN since 1997 (Figure 8 below). The decline in capex per subscriber is a reflection of both the upfront fixed costs involved and the lower demands placed by the lower-income subscribers increasingly being reached by the cellular networks.

Figure 8
MTN cumulative and
marginal capex per
subscriber: 1997-2001

Figure 8: MTN cumulative and marginal capex per subscriber: 1997-2001



[Source: MTN Annual Report 2001]

4.2.3 Baseline study results

The baseline study made the following assumptions for consumption behaviour:

- A discount rate of 15% for all annuity calculations (prime interest rate at the time of writing).
- A period of five years for all annuity calculations, except the length of phone

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ownership, which is limited to three years (accounting for breakage and theft).

- 30% of all calls in the peak period.
- 5% of all calls national.
- 5% of all calls short enough to be viable as an SMS.
- Total telephone market of 15-million of which five million are fixed lines and 10-million are cellular phones.¹¹ A market share in the cellular phone sector of 50% Vodacom, 40% MTN and 10% Cell C.¹²

The baseline then used market share data to determine the on-off net ratio for each network and the current list of prices for prepaid services. Only the cheapest prepaid cellular package is recorded because of the homogeneity assumption among cellular providers.

The author's survey made an attempt to determine the average consumption behaviour of a low-income household and use this to determine the baseline assumptions. However the results were less than satisfactory. The respondents were asked about the proportion of calls that were peak or national, but this did not give the proportion of call minutes, and so was unusable. In terms of proportion of calls, the small sample of 50 households had 56% in peak times and 16% national calls. Both are much higher than those used, but they do not reflect call minutes, only the proportion of calls. Further, both work in opposite directions (*see sensitivity tests below*) in terms of moving the crossover point between cellular and fixed line, making their impact on the result negligible. Calculations using these and not the baseline figures shift the crossover point from R85.70 to R84.10.

The results of the baseline simulation are shown in Figure 9 below, which plots the spend on communications against the minutes of communication received for the cellular and fixed-line options.

A number of points are important:

- For a lower monthly spend a consumer can get connected to a cellular network and have access. For fixed line this comes to R46.68 per month, while for cellular it is a base of R16.79 plus either 90c on MTN (minimum of one call per three months) or R5.83 for Cell C (one R35 call voucher every six months).
- Cellular provides more minutes of communication for your money (and therefore more utility) until your spend exceeds R85.70 per month, compared to prepaid fixed line and R147.32 for the conventional fixed-line service. So it makes sense to choose if you have a low monthly communication spend.
- The difference in the tariff structure between prepaid fixed line and the con-

In terms of proportion of calls, the small sample of 50 households had 56% in peak times and 16% national calls.

¹¹ These are the current 2002 figures rounded to the nearest million.

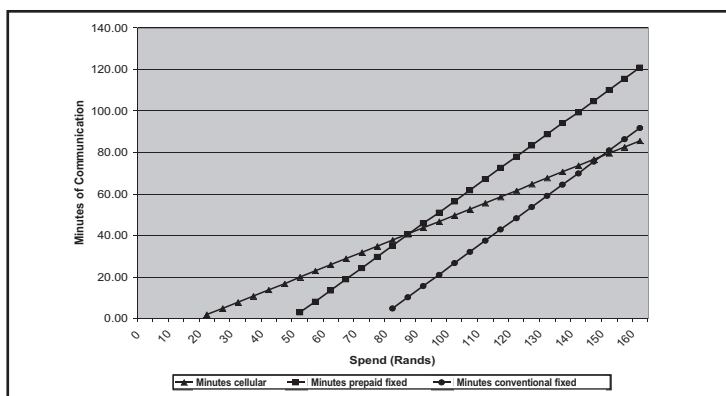
¹² This probably slightly inflates Cell C's market share at the expense of MTN and Vodacom. The split between Vodacom and MTN is not so important because they are both off-net calls to Cell C users (the baseline provider chosen).

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ventional fixed-line service is such that under the assumptions made in this model there is almost no difference in the average call price (92c for conventional versus 93c for prepaid) while there is a large difference in the monthly costs. This results in the crossover point between these two being close to R2,500, partly driven by the fact that off-net prices for both services are the same – usage prices only differ for on-net (to Telkom numbers). Given the market share of cellular, the majority of calls are off-net.

Figure 9
Cell-fixed line minutes
of communication
comparison for equal
spend: 2002

Figure 9: Cell-fixed line minutes of communication comparison for equal spend: 2002



[Source: From Telkom and Cell C tariff information]

The author's survey asked respondents how much they spent per month on communication costs. The results interestingly tie in well with the baseline results. It was found that the average spend among those with a cellular phone was R101 compared to an average spend of R202 for those with a fixed-line phone. Not only does this result demonstrate that cellular is the rational choice for those with a lower monthly spend, but also that the average spend is close to the baseline result of R85.70. It is even closer to the result of R94.70 where installation costs are treated as sunk (*see below*). Of course the survey was not a representative sample and one needs to await the results of the latest income and expenditure survey to get representative results.

4.2.4 Sensitivity tests

A number of assumptions were made about the calling characteristics of the representative consumer. Clearly these characteristics will differ with consumer preferences and so it is important to at least do some sensitivity testing of the model to changes in some of the parameters. If the results are particularly sensitive to one of the parameters, it is important to get the value correct. Those who differ in their assumptions about consumer behaviour can use the sensitivity tests to determine how the baseline result shifts with different assumptions. These tests do, however, demonstrate that the baseline assumptions do not make dramatic differences to the results and seem to be a reasonable approximation of the decision for most consumers.

4.2.4.1 Annuity length

In both cellular and fixed line there are upfront costs to getting connected to the network. An installation fee is the largest component in fixed line, and the cellular phone in cellular. How long before a person moves home or replaces her cellular phone will therefore impact on the annuitised monthly cost and her choice of technology. Figure 10 below tracks the cell-fixed crossover point for differing years for: (a) in the same dwelling (given baseline cellular phone length of three years); and (b) with the same phone (given baseline years in dwelling of five years).

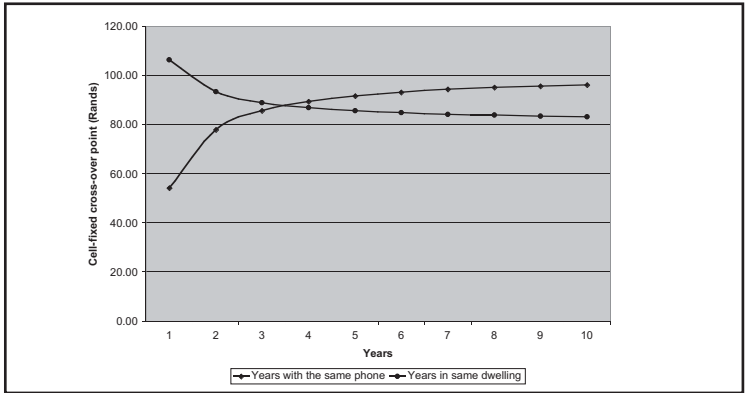
If the person spends less time in the dwelling, this will raise the monthly annuity for fixed line, raising the cell-fixed crossover point. If the person holds onto her cellular phone for less time, this will raise the monthly annuity for cellular, lowering the cell-fixed crossover point. The results suggest that these factors do not matter that much, except for periods of less than two years. In comparison to the baseline crossover point of R85.70, the crossover point jumps to R106.40 if the person is only in the same dwelling for a year, and drops to R54.28 if their cellular phone only lasts a year. However for values of two years or more for either variable, the crossover value lies in the band of R77.89 to R96.18. The differential is larger for the cellular phone simply because this is a larger cost item than the installation charge.

Those who differ in their assumptions about consumer behaviour can use the sensitivity tests to determine how the baseline result shifts with different assumptions.

If the person spends less time in the dwelling, this will raise the monthly annuity for fixed line, raising the cell-fixed crossover point.

Figure 10
Sensitivity of cell-fixed
crossover point to
years with the same
cellular phone/years in
the same dwelling

Figure 10: Sensitivity of cell-fixed crossover point to years with the same cellular phone / years in the same dwelling

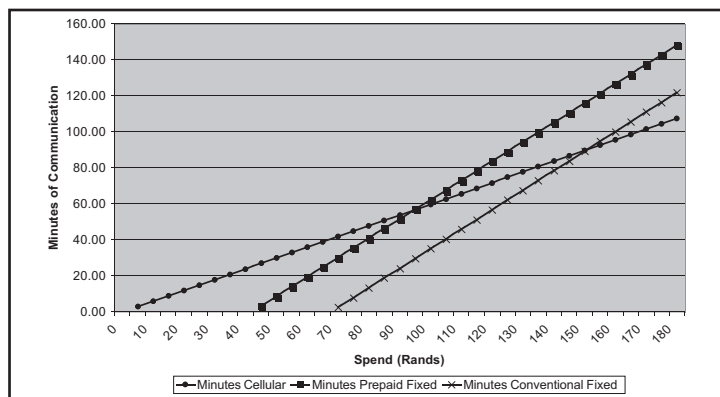


[Source: From Telkom and Cell C tariff information]

4.2.4.2 Treating installation costs as sunk costs

Many economists may take the position that installation costs should be treated as sunk costs and not enter the consumption decision of the consumer on a monthly basis. This will increase the crossover point because installation costs are higher for cellular than for fixed line. The change results in the crossover point moving up to R94.70 for cellular-prepaid fixed line and R150.60 for cellular-conventional fixed line (depicted graphically below).

Figure 11: Comparison of cell-fixed minutes of communication for equal spend: up-front costs treated as sunk costs



[Source: From Telkom and Cell C tariff information]

4.2.4.3 Calling structure

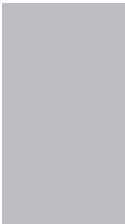
The calling pattern of the user will again affect the choice of technology (though one should not forget that after the initial choice, prices will also determine behaviour). There are key differences in the pricing structure that will determine how any changes in calling patterns impact the crossover point between cellular and fixed line.

- With cellular there is no distinction between local and long distance, resulting in a larger proportion of long-distance calls raising the average call cost of fixed-line use and so increasing the crossover point.
- The peak/off-peak spread is currently larger for cellular phones in SA, resulting in an increase in peak phone usage driving up the average call cost of cellular and lowering the crossover point.
- The proportion of potential SMS calls only benefits cellular subscribers and lowers the average call rates in cellular quite dramatically, increasing the crossover point.

From Figure 12 below we can see that the model behaves as we expect. What is interesting is that the calling structure does not seem to affect the crossover point very much, with the exception of the proportion of potential SMS calls. The crossover range for the proportion of national calls is R85 (no national calls) to

Figure 11
Comparison of cell-
fixed minutes of com-
munication for equal
spend: up-front costs
treated as sunk costs

There are key dif-
ferences in the pricing
structure that will
determine how any
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fixed line.

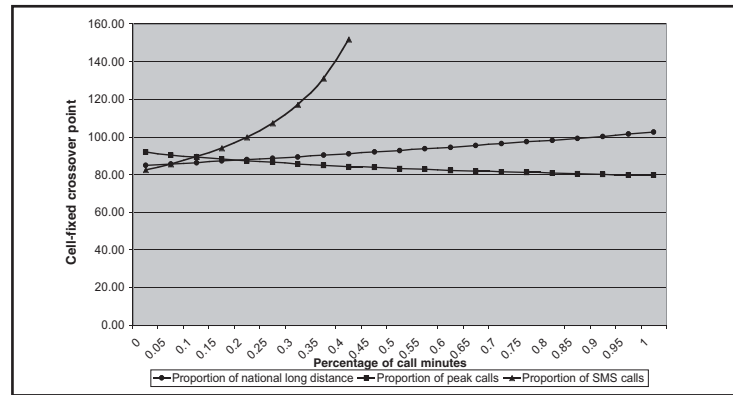


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R102.50 (all national calls) and for the proportion of peak calls R91.89 (no peak calls) to R79.69 (all peak calls). In contrast, as the proportion of potential SMS calls increases, there is an exponential growth in the crossover point. The reason is that the SMS call is considerably cheaper than a standard cellular call, bringing the average call price for cellular closer to the lower fixed-line levels. In fact, at around 60% of calls being potential SMSs, the average call rate for cellular (holding other usage patterns constant) equals that of fixed line. This implies that given the lower fixed monthly amount, there is no point at which fixed is cheaper than cellular.

Figure 12
Sensitivity of cell-fixed
crossover point to
proportion of calls
national, peak and
SMS length

Figure 12: Sensitivity of cell-fixed crossover point to proportion of calls national, peak and SMS length



[Source: From Telkom and Cell C tariff information]

The market share of cellular has quite a large impact on the fixed-cellular crossover point – a range from R53.60 for a 5% cellular share to R131.21 for a 95% cellular share.

4.2.4.4 Market shares

The market share of cellular and fixed line determines the extent to which calls made from each technology are on-net or off-net. In addition, SA cellular providers are allowed to price-differentiate between calls to different cellular networks (on own cellular network versus off own cellular network). As on-net calls will always be cheaper than off-net, a rise in the market share of one technology will lower its average call rates and increase the average call rates of the other technology, which will drive the crossover points.

The results in Figure 13 show that the market share of cellular has quite a large impact on the fixed-cellular crossover point – ranging from R53.60 for a 5% cellular share to R131.21 for a 95% cellular share. The reason lies in the extent of on-net/off-net call price differentiation in SA. The call rates for on-net and off-net for cellular

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do not differ significantly. Vodacom makes no differentiation, while Cell C and MTN have on-net calls costing 30c and 25c cheaper respectively in peak and 15c cheaper in off-peak periods. No differentiation is made between off-net to fixed-line networks and other cellular networks. In contrast, for fixed line the on-net/off-net differential is very large. This is partly due to the fact that fixed line differentiates between local and long distance and all cellular calls are long distance. An off-net local call therefore becomes a national call. Telkom's prepaid option charges R1.78 per minute to call a cellular phone in peak period and R1.06 in the off-peak period. In contrast, it charges for local calls R0.38 and R0.14 for peak and off-peak, and for long distance R1.04 and R0.52 for peak and off-peak.

Figure 13: Sensitivity of cell-fixed crossover point to market share of cellular

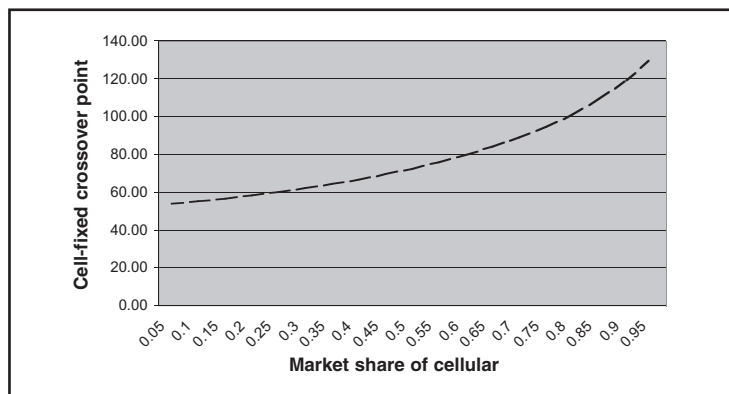


Figure 13
Sensitivity of cell-fixed
crossover point to
market share of
cellular

[Source: From Telkom and Cell C tariff information]

An interesting observation from the market share analysis is that for the low-income consumers who have a limited spend, there is a certain 'network externalities effect' from joining the cellular markets. The more people joining cellular, the greater the market share, and the lower the relative call-price differential with fixed line, creating a higher crossover point and a greater incentive for others to choose cellular over fixed line. This is especially true of the SMS feature that is confined to cellular networks and so demonstrates strong network externality effects.

4.2.4.5 Cost of the cellular phone

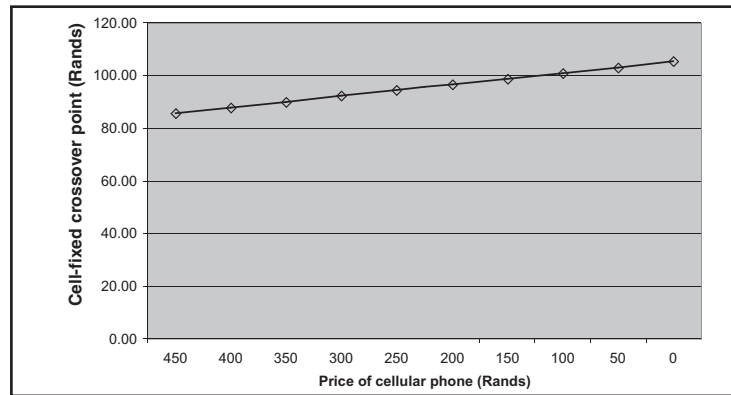
A key difference between cellular and fixed-line technology is that the handset itself makes up the greater proportion of the installation fee. Due to this, the emergence



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of markets for second-hand or stolen phones may reduce the *de facto* price that consumers are paying to get connected to the network.¹³ In contrast, the majority of the installation fee in fixed line is the physical labour of installing the line for which there is no second-hand market to reduce the price. The reduction in the price of the phone still leaves the potential subscriber with covering the full cost of the SIM card. In fact, MTN noted in its 2001 Annual Report that “prepaid subscriber churn increased from the previous year, driven primarily by affordability and high numbers of SIM packs sold, i.e. SIM cards sold without handsets”. The author’s survey also revealed that cellular users were often not paying a standard price for their phones. The results in Figure 14 show that as the price of the cellular phone reduces from R450 to zero, the fixed-cell crossover point increases from R85.70 to R105.30.

Figure 14: Sensitivity of cell-fixed crossover point to the cost of the cellular phone



[Source: From Telkom and Cell C tariff information]

Of course, theft may have the opposite effect. The high incidence of theft might increase the cost for some subscribers, as they need to insure the phones against theft or replace phones that are stolen and not insured. As low-income groups are less likely to be insured, a high incidence of theft in low-income areas may well start to raise perceived costs and lower the crossover point. This is the equivalent exercise to lowering the annuity length on the cellular phone (conducted above), which demonstrated that if phones last one year only, the crossover point dips just below R60 per month.

It is interesting to note that it is not in the interest of network providers to bar stolen phones. If stolen phones create a vibrant second-hand market for cheap phones, this

¹³ Employers may also sponsor phones, but this is no different to fixed line.

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enables more people to be connected, which improves the subscriber and revenue base of the network companies. It is equivalent to someone else subsidising the cost of the phone (these are the insurance company and the consumer).

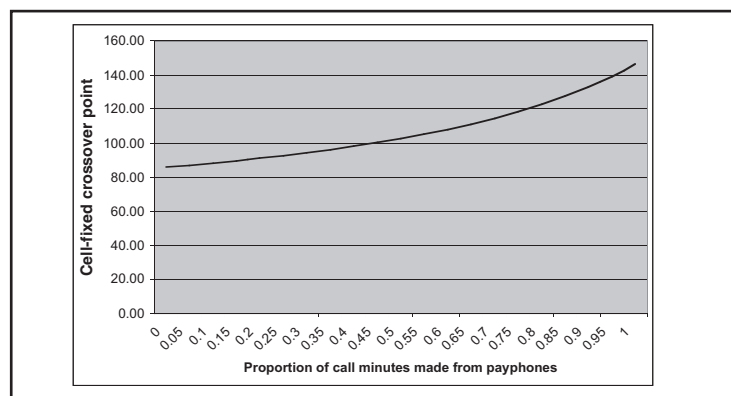
4.2.4.6 Mixed strategies – cellular/ payphone

Another alternative for many poor households is to make use of a cellular/payphone mixed strategy. The cellular phone provides two key components of the utility of telecoms – the ability to receive calls and the ability to make calls anytime. However payphone use brings cheaper call rates to the strategy to enable poorer households to increase the call minutes for their monthly spend. Of course, the feasibility of this strategy is dependent on having reasonable access to working payphones – the other goal of universal access policy.

Figure 15 below examines the sensitivity of the cell-fixed crossover point to a mixed cellular/payphone strategy. The results are intuitive – an increase in the use of payphones will lower the average call rate for the cellular user and so increase the crossover point with fixed line. At the extreme, using a cellular for receiving calls only and making all calls from a payphone, the crossover point increases from R85.70 to R146.37. A more reasonable scenario of say 50% of call minutes made from a payphone (remember the user is likely to reserve longer calls for the payphone because it is cheaper) yields a crossover point of just over R100. The author’s survey found that on average respondents who had cellular phones spent one-sixth of their communication spend on payphones, which yields a crossover point of around R90.

Payphone use brings cheaper call rates to the strategy to enable poorer households to increase the call minutes for their monthly spend.

Figure 15: Sensitivity of the cell-fixed crossover point to a mixed cellular/payphone strategy



[Source: From Telkom and Cell C tariff information]

Figure 15 Sensitivity of the cell-fixed crossover point to a mixed cellular/payphone strategy

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A mixed fixed-line home phone and payphone strategy is also feasible as it enables the subscriber to make calls outside of the home. In fact, the author's survey found that households with a fixed line on average spent similar amounts on payphones each month (R18 versus R20 for cellular). However it is less relevant to this exercise because: (a) it does not offer cheaper call rates for the user as payphones have higher call rates than fixed-line home phones; and (b) the author is not considering the merits of mobility in this costing exercise so that the benefit is not accounted for.

4.3 Assessing Non-Price Differences Between the Technologies and Their Utility Value to Low-Income Consumers

Given our focus on low-income consumers and their choice between fixed and cellular, our concern is how these factors may impact the so-called crossover point between fixed and cellular.

Apart from the differences in price there are differences in the actual products between cellular and fixed line that might give rise to different utility valuations of consumption. These valuations will differ with the preference set of the consumer and have the effect of moving the crossover point up or down depending on their impact. Given our focus on low-income consumers and their choice between fixed and cellular, our concern is how these factors may impact the so-called crossover point between fixed and cellular. This raises two key questions:

- Is there a definite higher utility from one specific technology for all people that will change the average crossover point?
- Is there a definite higher utility for lower-income groups compared to others for a particular technology that might differentiate them from the average?

One of the aims of the author's survey was to try to assess the impact of some of these non-price factors on the technology choice. However given that the sample was not representative and no real assessment of 'willingness to pay' was conducted, these survey results can only suggest which factors may be more important than others. What follows is an identification of the factors impacting utility differences between fixed and cellular, an identification of the direction in which they swing, and initial hypotheses on their impact on lower income households.

One feature that offers higher utility to low-income users is the prepaid tariff structure. Consumers who wish to control their communication costs value this feature. Originally this was an advantage of cellular technology, but in SA fixed line has a prepaid option too, making this factor unimportant in the technology choice.

4.3.1 Factors offering a higher utility from cellular

4.3.1.1 Convenience of mobility

The mobility of a cellular phone offers a clear higher utility to a fixed line because it enables the subscriber to extend the time period in which she has the option to receive or make calls.¹⁴ The extent to which this is valued depends on: (a) the length of time that someone is out of reach of a phone – to both receive¹⁵ and make calls; and (b) their valuation of the option. Usually those who value mobility and are therefore quick to purchase cellular phones are those who are out of reach of a phone for large parts of the day (for example, salespersons and students) or people who value the option highly (for example, business people who have a work and home phone). For the survey conducted, the households with a cellular phone cited the convenience of mobility as the second most important reason for choosing cellular over fixed line.

Are low-income households on average likely to be biased in any particular direction? Members of low-income households are less likely to have a phone at work, leaving them with longer periods of the day without a phone (*see Figure 16 below*). However they may also have occupations where they are unable to make or take calls anyway, making this irrelevant. Low-income households are also more likely to have a greater number of unemployed members, making the home phone available for longer parts of the day. In fact, the survey results suggest not having a phone at work is not an important reason for wanting mobility. A far more important reason is that they spend a lot of time each day travelling. *Apartheid* has left SA with the peculiar fact that low-income households are located furthest from working areas and so tend to spend longer travelling to and from work.

The other impact of mobility that was raised by low-income survey respondents was the ability to gain privacy for phone calls. Cellular enabled them to be away from a particular communal space when they spoke on the phone. This problem seemed more acute in lower-income households where the household size is larger and the space in the home smaller. Respondents in the survey ranked the privacy aspect second after the travel aspect and well ahead of the need for security while outside the home and the fact that they moved often.

Finally, the other component of the puzzle is the option value. One means of assessing option value is to make it proportional to the person's hourly wage rate. However this only assesses the business and not the home life component – both of which are important in communication. Further, it may be the contribution it makes to the overall earnings rather than a wage rate, because plumbers and builders probably have as high option values for cellular phones as leading business people.

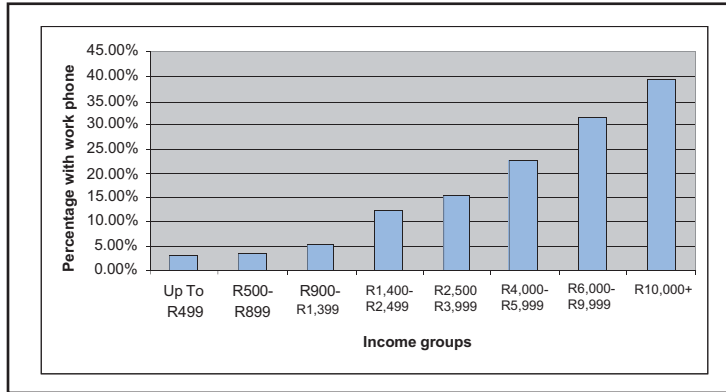
Usually those who value mobility and therefore are quick to purchase cellular phones are those who are out of reach of a phone for large parts of the day or people who value the option highly.

¹⁴ The argument to the contrary that some people get disutility from being disturbed by a cellular phone does not impact this assessment because those people can always switch it off.

¹⁵ To receive it must be possible that other people wishing to get hold of them know the location and number to call, making payphones an unlikely satisfier of this demand

Figure 16
Work phone penetra-
tion by income group:
2001

Figure 16: Work phone penetration by income group: 2001



[Source: AMPS 2001]

The most important functions include directory, caller ID, call-back, call waiting, call barring, call forwarding, voicemail and SMS.

4.3.1.2 Handset functionality

The cellular handset has standard functionality that a basic fixed-line phone does not – most importantly directory, caller identification, call back, call waiting, call barring, call forwarding, voicemail and SMS services. Additional functionality includes calculators, ring tones and games. Many of these functions are available on the fixed network, but at a higher cost of both the phone and the monthly fee. For instance, the inclusion of caller identification, call waiting, voicemail, call forwarding and call barring will cost an additional R41.02 per month on top of an installation fee of R23.94. The caller identification service would require a phone upgrade to be able to display the information.

If consumers valued these functions highly and included them in their fixed-line package, the crossover point for fixed-cellular would more than double from R85.70 in the baseline model to R178.26. This excludes features like SMS that are not available on fixed line. Of course, consumers may not value these features that highly, which means it may not affect the crossover point that dramatically.

It is hard to ascertain whether lower-income consumers are likely to get more or less utility from these services than other income groups. Such consumers of cellular services may send more SMSs, but given that the price of an SMS is still more than a local call on a fixed line, it is unlikely to have driven their choice upfront. The survey found that the additional features of the handset and the ability to send SMSs were ranked fifth and last respectively – clearly not as important as mobility and the tariff structure.

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4.3.1.3 Waiting times

Consumers who desire a phone suffer disutility from having to wait to get a phone. Given a *de facto* zero waiting time for cellular and a limited waiting time for fixed line, potential consumers are likely to get higher utility from cellular. However this higher utility is a once-off and just for the period that they would wait for a fixed line. The extent of utility differences will depend on: (a) the length of the waiting period for fixed line in their area; and (b) the disutility they suffer per day whilst waiting for the phone. Long waiting times for a fixed line in many developing countries have clearly been a primary driver in cellular growth.

Again, it is difficult to determine whether lower-income households suffer greater disutility than wealthier ones. First, they are likely to wait longer given the lack of circuits in poorer areas and even the lack of a local loop in some areas. At the same time they may value waiting less than wealthier households. It may also be that cellular is not as instant because of the need to save to cover the installation costs, making the waiting time of fixed line less important. The end result is ambiguous.

The author's survey found that waiting times were only the fourth most important reason for choosing cellular over fixed line, after no threat of disconnection, convenience of mobility and the lower monthly fees. The role of waiting times in the decision is likely to vary in importance depending on the expected wait for a phone. The respondents were asked how long they expected to wait, with the highest expected wait at one month and the average at 17 days.

4.3.1.4 No monthly fee

The absence of a monthly access fee for cellular phones means that those consumers that have no or little income to spend on communications in some months do not get disconnected from the network.¹⁶ This allows them to maintain a connection and the utility from being part of the network (with the option to receive calls and make emergency calls). It also ensures they do not pay penalty fees for being reconnected. Even with the prepaid option in fixed line, there is a monthly charge that if not paid for one month results in the service being suspended.

This feature would be valued higher by low-income consumers who are more likely to be in the position of either: (a) uncertain income due to non-wage employment; or (b) unable to afford the monthly fee in a slow work month. The survey results tended to support this. The single most important reason for choosing a cellular phone over a fixed-line phone was the fact that they would not be disconnected if they did not have any money to spend on communications in a given month.¹⁷ All the respondents were also asked whether they ever had months where they had less than R40 to spend

¹⁶ There are requirements to make a single call every three months (MTN) or buy a recharge voucher every six months (Cell C), but these are in no way as onerous as the monthly fee in fixed line.

¹⁷ It is important to note that given almost all respondents made the choice that was cheaper for them given their monthly spend, it is felt that cost was probably the primary driver with all other reasons secondary.

It is difficult to determine whether lower-income households suffer greater disutility than wealthier ones.

The absence of a monthly access fee for cellular phones means that those consumers that have no or very little income to spend on communications in some months do not get disconnected from the network.

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on communication. Half of the respondents with a cellular phone and 35% of those with a fixed line responded positively.

4.3.1.5 Status

A cellular phone offers some status utility that will be valued by certain consumers. This is apparent from the amount some low-income consumers are willing to spend on a cellular phone. In the survey sample, there were a few respondents who were spending close to a monthly salary on a cellular phone.

4.3.2 Factors offering a higher utility to fixed-line users

4.3.2.1 Calls received

It is likely that friends and families of low-income households will also be lower income and so are more likely to constrain their calling if the price was much higher.

The higher price for calling a cellular phone from a fixed line means that the amount of call minutes received will be lower for those people on the network that have a fixed line only.¹⁸ Less received calls may result in less utility from being part of the network. Of course, this will not impact the part of the network that is calling from cellular phones, as their costs remain unchanged.

Will this be different for low-income households? It is likely that friends and families of low-income households will also be of lower income and so are more likely to limit their calling if the price were much higher. However they may also be more likely to have a cellular phone and so it may make less of a difference. The survey found that this was the second-lowest ranked reason for choosing fixed line (above only the need to connect a computer), which means it is unlikely to be a major factor and only important to some.

4.3.3 Non-utility-based factors influencing choice

4.3.3.1 Inertia and switching costs

Given the recent introduction of cellular phones, households that already had a fixed line in the home may continue to keep that phone due to inertia or switching costs. The switching costs would include the installation fees for joining a cellular network. Interestingly, the author's survey found that inertia reasons¹⁹ were cited as the most important for choosing fixed-line communications among those with a fixed line. The importance of inertia may also be reflected in the fact that while 95% of cellular users felt they were paying less for communication than if they had a fixed line, only 77% of fixed-line users felt the same. Further, the third most important reason cited for choosing a Telkom line was the inability to afford the upfront installation costs of getting a cellular phone. On top of most already having a Telkom phone, this represents an additional switching cost

¹⁸ This adjustment will take place either through calling less frequently or through calling for fewer minutes each time.

¹⁹ Either they had a fixed line before the introduction of cellular or they moved into a house with a fixed line already installed.

4.3.3.2 Exclusion from one technology choice

In some cases the choice of technology is already made for the consumer because they are unable to make use of one type of phone. It is usually the case that consumers are unable to connect to the fixed-line network. There are a number of reasons for this: (a) they were previously disconnected and owe the operator money; (b) the operator may not install in their area (increasingly rare); (c) they are not considered creditworthy (less important since prepaid option is available); and (d) there is a fixed-line phone on the property already that they cannot use.

The flip side of the above argument is that many consumers who were disconnected from the fixed-line network for not being able to pay their bills are now unable to get a conventional fixed line until they pay their outstanding debts to Telkom. Telkom has recently allowed such people to convert to prepaid or pay a minimum monthly amount to be able to receive calls and make emergency calls. However Telkom still pursues debt repayment and so many do not want to keep their Telkom phones, as they enable Telkom to locate them in future. Given the high levels of disconnections over the past two years in the failed attempts at universal service, this proportion of the population may be highly significant. It will also be concentrated in the lower-income groups which would be the ones defaulting. In the author's survey, it was found that 25% of cellular phone owners had previously been disconnected and owed Telkom on average R650. This is not a representative sample, but indicates the potential importance of this reason. Interestingly, some have cited ignorance over the high costs of calling cellular phones from fixed lines as a reason why many households saw their monthly bills escalate out of control.

Before the prepaid option was available on fixed line, the creditworthiness of the customer was another barrier to low-income earners getting a fixed line, but this requirement does not exist on the prepaid fixed-line option.

In the author's survey, 91% of cellular users said they could not get a Telkom phone. Yet when asked to rank reasons for choosing cellular, the inability to get a phone was always ranked very low (on average eighth out of 11 reasons). This may suggest that they would have chosen cellular anyway (and given their spending levels this was the rational choice). Of this 91%, 25% cited being disconnected as the reason, 20% cited not being creditworthy, 5% cited that Telkom does not install phones in their area, and 50% cited that there was a Telkom phone on the property that they could not use.

4.3.4 Conclusions on non-price utility of cellular versus fixed

Given that there are factors that influence the utility in favour of each technology beyond call minutes made, it is ambiguous whether cellular consistently offers

Many consumers who were disconnected from the fixed line network for not being able to pay their bills are now unable to get a conventional fixed line until they pay for their outstanding debts to Telkom.

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There seems to be ample evidence that people are making the choice primarily on a cost basis.

greater utility than fixed line for low-income users without further empirical work. Clearly, individual preferences are going to play a role in consumer choice; the question is whether that distribution of preferences has a cellular bias for low-income consumers. The author's survey was not representative, nor did it attempt to provide any 'willingness to pay' measure for certain features.

Regardless, there seems to be ample evidence that people are making the choice primarily on a cost basis. This being the case, the differing features cited above are likely to operate at the margin – for those households spending around the crossover point level. In this case, maybe the correct conclusion at this point is that there is no clear consistent technology bias, with an even distribution of choice around this point. Yet, my instincts suggest that there were more compelling reasons for low-income households to choose cellular over fixed line aside from cost. This would suggest that the true crossover point lies above the cost-based measure.

4.4 Affordability and Choice Between Fixed and Cellular

4.4.1 Affordability of telephony

The choice of whether to get a telephone or not depends not only on its affordability but also the utility the household or individual will derive from usage. It further depends on the alternative options open to the household or individual (excluding home ownership), such as payphones, work phones and friends'/neighbours' phones.

Affordability of a telephone is usually defined as a percentage of a household's/individual's income.

Affordability of a telephone is usually defined as a percentage of a household's/individual's income. However specifying this level is not easily done and is subject to debate, as people spend varying levels of income on communications depending on their preferences. A good example is the spending as a percentage of income for different household income deciles in SA for those households that do spend on communications. Table 8 shows that this varies from a high of 7.85% for the lowest decile to 2.34% for the highest decile.

Table 8: Monthly communication spend by income decile: 1995

Income decile	Average monthly income (rands)	Average monthly spend on communications (those who spend something)	Communications spend as % of monthly income
1	363.55	30.50	7.85
2	584.53	41.40	6.97
3	832.56	60.25	7.19
4	1,103.79	64.24	5.80
5	1,451.35	76.10	5.21
6	1,960.38	93.72	4.74
7	2,753.15	120.40	4.34
8	3,989.33	154.09	3.88
9	6,122.12	192.08	3.14
10	15,880.67	325.41	2.34

* Only includes those who spend more than R0 on communications [Source: OHS 1995]

Some authors (*Milne 2000*) and universal service agencies have approached the problem by finding an income group where there is 'universal service' and determining the telephone spending as a percentage of income for this group. This is then used as the affordability threshold level for all other income groups. Such cost of basic access is compared to the percentage of income for each income group to determine if telephony is affordable to that income group.

Milne (2000) uses a figure of 1.5% of income and gets a good fit for a number of countries. In SA those earning over R6,000 per month have access rates of 85% or greater, which is approaching universal access and so the spend of this group (3.14% from above) may also be a decent yardstick.

In Table 9 below, a number of threshold levels have been set for comparative purposes from 1.5% to 3% of income. The unshaded areas are those income deciles that cannot afford any type of phone given such threshold levels. The lightly shaded areas denote income deciles that can afford a cellular phone but not a fixed line. The slightly darker shading includes those income deciles that can afford a prepaid fixed line as well. Finally the darkest shading includes income deciles that can also afford a conventional fixed-line service.

Table 8

Monthly communication spend by income decile: 1995

Table 9
Affordability of communication by income decile: 1995

Table 9: Affordability of communication by income decile: 1995

Income decile	Average monthly income (Rands)	1.50%	2%	2.50%	3%
1	363.55	5.45	7.27	9.09	10.91
2	584.53	8.77	11.69	14.61	17.54
3	832.56	12.49	16.65	20.81	24.98
4	1,103.79	16.56	22.08	27.59	33.11
5	1,451.35	21.77	29.03	36.28	43.54
6	1,960.38	29.41	39.21	49.01	58.81
7	2,753.15	41.30	55.06	68.83	82.59
8	3,989.33	59.84	79.79	99.73	119.68
9	6,122.12	91.83	122.44	153.05	183.66
10	15,880.67	238.21	317.61	397.02	476.42

Unshaded = cannot afford any type of phone, lightest shading = can afford a cellular phone only; darker shading = can afford either a prepaid fixed line or cellular phone; darkest shading = can afford conventional fixed line, prepaid fixed line and cellular.

[Source: OHS 1995]

The results show that at current tariff structures for telephony in SA, and assuming a 1.5% affordability threshold, the top 70% of households in terms of income are able to afford a cellular phone, but only the top 30% can afford a fixed-line phone. Increasing the threshold to 2% brings an additional 10% of households into the affordability net for cellular and extends the reach of fixed line to the top 40%. Moving the threshold to 3.5% makes little difference, but at 3%, 90% of households in SA can afford a cellular phone.

It is also interesting to reflect on the impact of the introduction of prepaid fixed line. In Icasa's opinion this package did not go far enough. The results of this exercise suggest that the Authority may have a point. The addition of the prepaid option only manages to pull an extra 10% of all households into the affordability threshold – low when compared to the achievement of cellular.

4.4.2 Choice of technology

Once the decision of getting a telephone or not is made, the next choice facing the household is whether to get a cellular or a fixed line. A means of determining this is to examine the average spend on communications for those in each income decile and determine whether a cellular or fixed-line phone would maximise their utility for that spend. The least subjective means of doing this would be to ascribe utility purely to the number of call minutes for that spend, given that we are unable to

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ascrcribe exact utility valuations for the other factors influencing utility from different technology choices.

Table 9 above examined the average spend of different income groups. Given our fixed-cellular crossover point of R85.70 for the baseline study, this implies that the bottom 50% of households would maximise their utility from consumption by choosing cellular over fixed line. If we take the installation costs as sunk, this would put the next decile in the category of cheaper to go cellular. Of course, an option for all households is to use payphones, which is cheaper for all levels of expenditure, but without the extra utility of being able to receive calls.

This reinforces the observation that despite the efforts made in universal service in fixed line, low-income households have a clear preference for mobile under current tariff structures.

5. POLICY CHOICES ON EXTENDING OWNERSHIP

The focus of this section is how best to tackle the ownership component of universal service in South Africa given the experience of the past reform and current universal access policy. This section does not evaluate the pros and cons of pursuing ownership over broader access, nor the proportion of universal access effort that should be dedicated to each. It takes expanding ownership as a given goal and looks at the best means of implementing it. The analysis so far has demonstrated the following with respect to ownership policy:

- There has been a heavy emphasis within the universal service policy of South Africa on fixed line solutions – especially the component that has increased ownership rather than pure access as its goal. This bias has entered through the emphasis on licence obligations rather than direct tax/subsidies so far. One measure of this cost is the estimated R17bn invested by Telkom already through the investments made during the exclusivity period. This has largely been socially wasteful investment with the possible exception of some exchange infrastructure and those customers that proved to be economically viable at current tariffs. In contrast, the only real binding obligation of cellular is the roll-out of a small number of payphones.
- The policy has failed to deliver significant ownership increases and apart from some marginal gains in rural areas, there has been no growth in fixed line access among the target income groups. The large investments by Telkom can in fact be labelled as social waste – a huge cost to the economy. Going even further than that, it can be argued that many households are now worse off from the policy because they are left with debt to Telkom, which not only pre-

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There has been a heavy emphasis within the universal service policy of SA on fixed line solutions – especially the component that has increased ownership rather than pure access as its goal.

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Fixed-line providers have no real incentive to pick up the lowest communication spenders in comparison to cellular, and therefore have no incentive to offer a tariff structure that captures these subscribers.

vents them from getting a fixed line phone in the future, but destroys their credit rating for other purchases. Telkom's current bad debt is in the region of R1bn – though maybe only half of this can be ascribed to households, with the rest including fraud and business users.

- Despite a lack of real universal access obligations for cellular, that technology has been the driving force behind improving access in South Africa. Also, based on cost simulations and affordability tests, it is clear that the tariff structure and levels are driving this adoption among lower income groups who have a clear preference for cellular over fixed line.
- To put the extent of social waste from the current policy in perspective, if the government had subsidised each of the targeted 1.67-million households from under-serviced areas with a cellular phone (including the infrastructure associated with it), it would have cost them roughly R3.3bn.²⁰ If they had decided to give every household without a phone currently (approximately five million households), it would cost them R10bn. Of course, given that the monthly costs of remaining connected to the cellular network are almost zero and consumers would not let spending get out of control because they would be on prepaid, one could safely assume that all of these households would still be connected today: it would be cheaper and more successful.
- Fixed-line providers have no real incentive to pick up the lowest communication spenders in comparison to cellular, and therefore have no incentive to offer a tariff structure that captures these subscribers. The reason is that these users impose greater fixed costs on the fixed line operator than on the cellular network operator. Recovering these larger fixed costs requires the subscriber to have a greater monthly spend than what cellular operators are willing to take.

The focus of this section is on outlining a change in direction in universal service policy with respect to ownership. Although it makes some detailed recommendations, it represents more a starting point for shaping specific policies. It begins by putting forth some general principles and then examines them in the context of the different universal service tools available.

5.1 Principles of Universal Service Policy on Ownership

5.1.1 Remove the technology bias!

An obvious conclusion from this analysis is that the previous bias of universal service policy towards fixed line should be removed. It has crept in through licence obligations and more recently the focus on VoIP for small and medium-sized enterprises (SMEs) delivering in low teledensity areas. The removal of a specific technology bias in the delivery of universal service is a standard recommendation from the theoretical literature (*for example, Laffont and Tirole 2000*). The literature goes further

²⁰ This costing is based on R400 for a cellular phone and SIM card (this is the best deal currently being offered to consumers – buying 1.67-million phones may get a higher discount) and R1,600 marginal capex per subscriber (based on the current marginal capex of MTN).

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to suggest that subsidies either be targeted directly to consumers or in the event of being given to producers, be allocated on a competitive bidding basis to get the least cost solution.

The above conclusion is only problematic if for some reason fixed-line access is preferred to other technologies like cellular. One advantage of fixed line is the lower call rates, but this does not translate into cheaper overall prices for ownership due to the monthly fixed fee. A second advantage is linking computers to the internet – a broader information society goal in SA. Yet the lowest-income earners do not have computers and are unlikely to have them in the near future. Finally, fixed line is cheaper for a communication spend over R85.70. Yet most low-income earners do not spend this much and so their utility is not maximised with fixed line. Those that do spend more do not fall within the universal service category. However in cases where consumers do not pay monthly fees or where there is intent to push out internet connectivity at the same time, a case could be made for this technology bias. This would include payphones, community telecentres and school access.

The removal of any technology bias in universal service provision should naturally lead to a greater focus on cellular solutions to universal access problems – at least that is what the market is already telling us – not only from an affordability but also a customer preference perspective. It is also clearly in the minds of the policy-makers at the Department of Communications (DoC). First Telkom was encouraged to use fixed-wireless technologies to bring down the cost of service delivery in rural areas, but in the more recent policy announcements, Telkom and the SNO were granted ‘fixed-mobile’ licences to roll out in under-served areas. Although this offers limited roaming (to a specific area), it is clearly acknowledging that mobile technologies are more effective in dealing with universal service.

If the DoC already recognises this, why is it creating new licences to enable fixed-line providers to better service the universal service obligations and not just go ahead with cellular operators? The cynics among us would argue that it is yet another clear case of government trying to maximise the asset value of its public enterprises, either to get a higher sale price or higher dividends over the medium term on its shareholding (*see, for instance, Ayogu and Hodge 2002*). As the SNO will have a 30% government stake, the granting of this licence to the SNO also benefits government. This interpretation of government behaviour in telecoms is becoming more accepted. In fact, Telkom CEO Sizwe Nxasana recently made explicit reference to such behaviour when he warned government that industry liberalisation could undermine Telkom’s value ahead of its planned listing (*Business Report, 21 August 2002*).

However another possible reason is that there may be limited means of delivering a targeted universal service policy through cellular because of arbitrage issues.

One advantage of fixed line is the lower call rates, but this does not translate into cheaper overall prices for ownership due to the monthly fixed fee.

As the SNO will also have a 30% government stake, the granting of this licence to the SNO also gives benefits to government.

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Essentially, subsidising telephone access to a household when the phone is fixed in location means needy subscribers specifically are targeted. As soon as the subscriber could move the phone, there is the possibility that she might sell this on to less needy consumers in other areas. As a result, the policy would not fulfil its goal. This is taken up below in more detail.

5.1.2 Do away with specific roll-out targets

Rollout targets clearly do not offer the correct incentives to network operators.

The source of technology bias in the current SA universal service policy is the licence obligations – specifically residential roll-out obligations rather than mandatory contributions to the USF or payphone roll-out. If a more technology-neutral – or even cellular biased – policy is preferred, residential roll-out obligations on the SNO or any future fixed-line operator may not be the most efficient use of those funds.

In addition, roll-out targets clearly do not offer the correct incentives to network operators. They give operators the incentive to connect households, but no incentive to keep them connected (which is also difficult to ask the operators to do). The imposition of fines for missing roll-out targets means that firms will engage in the exercise rather than shirk it completely, but this is often socially wasteful investment as consumers may quickly disconnect, and as noted earlier, may in fact be worse off as they are left with debt. The emphasis should be on building sustainable access and ownership. A far better measure of success of any policy would be realised and sustainable demand for the service.

If there is a desire to have the SNO make greater contributions than the 0.16% tax in order to 'level the playing field with Telkom', it is best done through a higher contribution for a limited number of years or an upfront lump-sum contribution.

5.2 Application in Different Universal Service Policy Tools

5.2.1 Licence obligations

A preferred policy to specific roll-out targets is one where all obligations towards universal service are made through contributions to the USF. If there is a desire to have the SNO make greater contributions than the 0.16% tax to 'level the playing field with Telkom', it is best done through a higher contribution for a limited number of years or an upfront lump-sum contribution. As there has been no research on the success or failure of payphone roll-out, this paper cannot argue for or against keeping payphone obligations on the menu of licence conditions.

However although specific roll-out targets may be undesirable, it may still be desirable to ensure that the basic exchange infrastructure that covers most areas is in place so that those who make the choice to connect to either a cellular or fixed-line network are able to do so. This was part of the emphasis in the roll-out targets given

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to Telkom and was more explicitly a cellular licence condition through the licence condition on geographical and population coverage.

5.2.2 Price level and structure regulation

The success of cellular is based largely on tariff structures. The focus of much of the regulation to date has been on price levels, to the detriment of stronger recommendations on pricing structures.

It is apparent from the cost simulation model that consumers with a low monthly communication spend need a tariff structure that places less emphasis on monthly fixed fees to improve their utility from gaining access and therefore their likelihood of demanding a telephone in the home. Interestingly, the installation charge seems to count less (as demonstrated by higher cellular installation charges) than fixed monthly charges in terms of impact on affordability. The tariff structure issue is less of a problem in high-income countries because even lower-income consumers are able to afford the basic monthly rental and so fixed line is often the usual choice. However in poorer countries with poorer households, the tariff structure clearly matters. The result of cellular being able to offer this tariff structure means that it has been a popular solution to communication needs.

A goal towards making fixed line serve the universal service aims in poorer countries would be to focus on getting a tariff structure more similar to cellular to enhance affordability for consumers with very low monthly communication spends. It is not in the scope of this paper to suggest what the tariff structure should be because of the differing technology and cost basis for fixed line. Yet it is important to remember that even if the projected monthly spend was less than the current tariff structures, it might be a more sustainable and therefore more profitable tariff structure if it leads to consumers maintaining it for longer periods.

A possible solution would be to ask the fixed-line provider to have a tariff structure with either no monthly fixed fee or one set at a much lower level to make it more affordable (say R10 per month). By imposing such a specific low monthly fee, the network provider is forced to put together a tariff structure similar to cellular, including higher installation fees and call rates. The network provider would be able to set installation fees and call rates allowing it to recover costs, but should be subject to some form of cost regulation by the regulator, as the natural incentive for the network operator who does not want to sign up low-income households with low monthly spends is to set such rates too high, making it an active discouragement to these potential subscribers.

Since cellular already has tariff structures of this sort, there is less need to regulate these networks' price structures. However it is still important to regulate their price levels to ensure there is no collusion in such an oligopoly market structure.

A goal towards making fixed line serve the universal service aims in poorer countries would be to focus on getting a tariff structure more similar to cellular to enhance affordability for consumers with very low monthly communication spends.

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5.2.3 Universal Service Fund

The USF offers the opportunity to directly subsidise operators or households to assist in expanding access. In that way it differs from the above suggestions on pricing and exchange coverage. The key question concerns how best to spend this money. One solution may be to only spend it on broad access and not ownership. This option would probably get much support. However if some funding is to be spent on ownership, what would we choose?

5.2.3.1 Subsidising the networks – extending network coverage

An immediately obvious and highly targeted use of the USF would be to assist in extending geographical coverage of the fixed and cellular networks to those remaining parts of the population without coverage.

An immediately obvious and highly targeted use of the USF would be to assist in extending geographical coverage of the fixed and cellular networks to those remaining parts of the population without coverage. Although licence obligations are providing reasonably broad coverage, specific funding would help to cover the highly uneconomical areas.

This immediately raises the questions of: (a) how to make the choice on whether it is cost beneficial to extend coverage at a huge cost to certain very densely populated but poor areas where demand may be minimal; and (b) what technology to use. Ignoring the first issue as something to be assessed by the universal service agency, the second issue should be addressed in the technology neutral manner suggested as one of the principles of universal service provision.

The end goal of such a policy is the maximum take-up of the service by consumers at the lowest cost. This has typically followed an engineering approach to universal service where one finds the cheapest technology to provide infrastructure coverage of an area. This is valid if the service has a linear price, as lower costs translate into lower prices and so into greater demand. However if the service uses a two-part tariff (as all telecoms services do), it is a little more complex. In this case, the universal service agency needs demand function information to see how consumers value the different two-part tariff options available for different technologies. The contract should then go to the firm that offers the maximum social welfare (subject to breaking even) and not the lowest price.²¹

Given the demand profiles that have been sketched in this paper for low-income consumers, the two-part tariff that is likely to maximise take-up and social welfare is one that has a very low monthly access fee. This would also suggest that SA's efforts to use lower-cost technologies in the fixed-line roll-out were doomed to fail because Telkom was not allowed to price discriminate and so still offered the usual range of Telkom service options – none of which were suitable for really low-income households with a low monthly spend. The prices paid are also reflective of

²¹ The franchise bidding literature stresses this point - see for instance Viscusi et al (1998: 418).

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the average costs of the network and not of any cheaper technology that might have been used for that specific line.

It is clear that subsidised access should be assessed in this manner rather than the conventional cost method. Under this scenario it is still possible for a fixed-line solution to win the tender if a really low-usage tariff structure is offered. This would be feasible for Telkom if it introduced a new tariff offering (as suggested above) or removed the price discrimination constraint, which might allow its prices in these areas to reflect cost savings. Alternatively, new SME entrants would not have Telkom's price discrimination problem and might in fact be able to offer a tariff structure closer to that demanded. Barring these outcomes, it is likely to be cellular that wins the contracts.

5.2.3.2 Subsidised access for target consumers

Subsidisation of target consumers can take place through subsidising installation (including handsets), monthly fixed fees or call rates. A key issue that arises is whether one can feasibly implement such a strategy for cellular technology. If not, then such a strategy would be inherently technology-biased and therefore fall foul of one of the principles set out above.

The problem with implementing this type of subsidisation programme with cellular is arbitrage. A cellular handset that is either subsidised or makes use of subsidised call rates can easily be sold to another consumer who is not the target of such programmes. This would render the subsidy useless through failing to improve access among target groups. The key question is how significant the arbitrage problem is likely to be. This problem does not exist to the same extent in fixed line because the phone is tied to a particular address and is not mobile. Unless the handset itself is subsidised or there is scope for the applicant to be dishonest, the subsidy should achieve its target.

The fixed-mobile concept licence introduced in SA is seen as a means of potentially getting around this. Although it combines the benefits of cellular technology, it is fixed to a geographical area that presumably limits the arbitrage potential. However, this may not be as great a solution as it initially seemed. We need to consider the success of a policy in terms of boosting sustainable demand and so any subsidy should account for the monthly spend of the target group of consumers. If the fixed-mobile would be rolled out with current Telkom tariff structures, it is unlikely to be that successful. This might be necessary since Telkom is forced not to price-discriminate between users (unless the regulator considers this new service as completely different). Any benefits from a particular technology must be translated into tariff structure changes. This may be less of a problem if, following the

Given the demand profiles that have been sketched in this paper for low-income consumers, the two-part tariff that is likely to maximise take-up and social welfare is one that has a very low monthly access fee.

A cellular handset that was either subsidised or has subsidised call rates on can be easily sold to another consumer who is not the target of such programmes.

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Some service providers are bringing in refurbished phones from other markets where there is lower demand for the more technologically backward models.

suggestion on price regulation above, Telkom implements a tariff structure that is similar to the current cellular model.

Even if fixed-mobile is able to remove the arbitrage problem to some extent, it is still unnecessary to limit such licensing to fixed-line operators. Since cellular operators can as easily implement such a service, the only rationale is to ensure that state-dominated fixed-line operators get a larger slice of the USF pie while plugging some of the problems with fixed-line roll-out.

It might also be possible to subsidise or bring down the cost of handsets for cellular without the restrictions on mobility. Already some service providers are bringing in refurbished phones from other markets where there is lower demand for the more technologically backward models. In the same manner in which older model computers are often donated to poorer countries, a similar deal could be done with cellular. Older models will have limited appeal to the wealthier consumer, enabling the government to subsidise the phone further with the knowledge that wealthier consumers would still get a newer model (of course the extent of this preference needs to be tested). Alternatively, a low-feature model could be developed for low-income consumers that would have a similar effect – lack of appeal to the wealthier consumers.

5.3 Concluding Remarks

Taking the burden off fixed line for universal service provision may in fact enable the acceleration of the liberalisation of telecoms in SA.

Removing the burden of universal access from fixed line also removes one of the apparent barriers to further liberalisation of the sector. Universal service and the impact of liberalisation have been familiar reasons for restricting further liberalisation. Telkom, among others, argued that having resale competition would limit the investments made by new entrants, rendering the goals of mass roll-out impossible. Removing this argument from the armoury of those who oppose competition means they are largely left with the reason of protecting the value of state assets – a reason more politically difficult to defend. As such, taking the burden off fixed line for universal service provision may in fact enable the acceleration of telecoms liberalisation in SA (satisfying local business and international governmental – specifically World Trade Organisation – pressure groups).

Obvious benefits are the better prices and products for business users. Fixed line remains the core application for business users who require bandwidth for data services and who make considerably more calls than residential users and so for whom fixed line is a cheaper technology. Of course, one of the current biggest users are cellular network operators. Improving prices on leasing and interconnection should lower call rates in cellular, making it even more attractive to low-income users.

Another indirect benefit of doing away with the emphasis on fixed-line universal services is that the removal of specific SNO roll-out targets might help to stimulate more interest in this licence's bidding.

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A further problem government faces is the number of people who have disconnected from Telkom and remain indebted to the company. These households are now prevented from getting a fixed-line phone until they repay this debt. It further has potentially far-reaching effects on their lives though destroying their credit rating. Should something be done to eliminate this debt, or are there too many moral problems in doing so?

Finally, it is interesting to note that the new International Telecommunication Union (ITU) definitions for universal access and service incorporate cellular technology and move away from a fixed-line focus. The thrust of these definitions is very much in line with the results displayed for SA. The comparison of new and old definitions appears below.

Table 10: ITU definitions of universal access

	Old definition	New definition
Universal access	A telephone within walking distance Telecentres in every community	Mobile coverage of all main population centres Internet cafes in every community
Universal service	A telephone in every home A computer in every school An email address for every citizen	A mobile phone for everyone that wants one
Affordability	Subsidised access (high usage costs subsidise low line rental)	Pre-paid access (pre-paid usage charges include line rental)

[Source: ITU]

A further problem that government now faces is that the number of people who have disconnected from Telkom and remain indebted to the company.

Table 10
ITU definitions of universal access

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APPENDIX

A.1 Telephony Data in the October Household Survey/Labour Force Survey and the All Media and Products Survey

Sources

There are two national representative surveys that include questions on telephony that can be used for assessing access – the October Household Survey (OHS), which was changed into the Labour Force Survey (LFS) in 2000 and the All Media and Products Survey (AMPS). The OHS is done by Statistics South Africa and uses all South African households (and individuals) as the universe from which its sample is drawn. The AMPS is commissioned by the South African Advertising Research Foundation (SAARF). It arose out of the need by the marketing and advertising industry to have an objective source of data about the use of the mass media, and about the consumption of products and services by users of the mass media. The universe for AMPS comprises of all adults aged 16 and older, with the exception of “residents and staff of such institutions as prisons or hospitals, military personnel on active service, and, within each population group, minority sub-populations in certain geographical areas” (AMPS Technical Report 2001: 8). For household analysis, there should be very few differences between the results for the two surveys, and the study of access to telephony confirms this.

The OHS was started in 1994, but at the time of writing, the most recent database available was for the year 2000. The AMPS has been running in various forms for the last 23 years, but the author only had access to the full electronic database for the period 1998-2001.

Telephony questions

The OHS asks the telephony questions at a household level. The questions on telephony have varied but in general the following three questions are asked:

- Does the household have a telephone in the dwelling (excluding a cellular telephone)?
- Does any member of this household have a cellular telephone?
- How many minutes do you have to travel to the nearest telephone you can use (by your usual means of transport)?

The OHS 1999 differed from the others in that it only asked whether the household had a telephone or not, not separating fixed line from cellular. The OHS 1995 and

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1996 differed on the question about minutes to the nearest telephone, instead asking distance. The OHS 1995 also included a question on whether the nearest telephone was at the neighbour, a payphone, or in the shop/clinic. In addition, the Income and Expenditure Survey was also conducted in 1995, which allows one to look at telephone expenditure per month for each household.

The AMPS has more questions on telephony. There is very little change in the content of the questions asked, just more are added over time. The questions in the 2001 survey were:

- Do you have a telephone in your home (fixed line)?
- Do you have a telephone at work?
- How many cellular phones are there in your household? (added 2000)
- Do you personally own, rent or have use of a cellular phone?
- Please think about the cellular phone that you personally use most often. Is it private or company maintained? (added 1999)
- Still thinking about the cellular phone that you personally use most often, are your calls on a contract call rate or are they on a prepaid call rate? (added 1999)

Data issues

For the OHS datasets, there are a number of key problems:

- Income data is done on a person level and income categories are used in all but 1995. This prevents aggregation to the household level and therefore any analysis of access by income group (a key issue)
- The fact that the 1999 questionnaire did not separate fixed line from cellular means that household ownership of each separately is impossible to find out.
- In the 2000 questionnaire, the data for cellular phone penetration is inaccurate because the previous question that asks the household if they own a Telkom phone then directs them to skip the cellular phone and minutes to the nearest phone questions if the answer is yes. The result is that it only picks up those that only have a cellular phone and not both.
- Unavailability of the 2001 data is limiting

For the AMPS data there is far greater continuity and no obvious errors in the questionnaire making it more attractive to use. In addition, it includes a question on work access that is important. Unfortunately data was only available from 1998 but at least there were figures for 2001.

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However, given that there are four questions on cellular phones, the question arose as to which to use to reflect ownership at a household level. In the end it was decided to use the question "Please think about the cellular phone that you personally use most often. Is it private or company maintained?" to determine ownership. The figures for this question closely matched the household ownership figures of the OHS.²²

A.2 Phone Ownership and Usage Questionnaire for Low-Income Households

The purpose of this questionnaire is to find out more about your choice of home phone - either cellular or a Telkom phone. *If you have both a Telkom phone and a cellphone, please do not answer this questionnaire.* This is for an academic study and not for any telephone company. If you have any queries please contact James Hodge at the University of Cape Town (021-650 4361).

1. What type of phone do you have in the house?

Cellphone Telkom phone Telkom prepaid

2. What is the most you are prepared to spend on phone costs each month (calls and monthly charges) R_____

If you have a cellphone, please answer the questions in the cellphone section. If you have a Telkom phone, please answer the questions in the Telkom section. Whichever phone you have, please answer the questions on phone usage and your personal details.

22 The 2001 figures for AMPS



Cellphone owners

3. Please can you tick those reasons for choosing a cellphone rather than a Telkom phone that were important considerations for you. Of those reasons that were important, please rank them from the most important to the least important (start at 1 for the most important).

	Important or not?	Rank
You could not get a Telkom phone		
You value the convenience and mobility of a cellphone		
You value the extra features on the cellphone handset (e.g. directory, voicemail, caller ID)		
The ability to send cheap SMS		
You didn't have to wait to get a phone		
You got a cheap or free cellphone and SIM card		
There are lower monthly costs of staying connected		
You will not be disconnected if you do not have money for the phone one month		
You can control the amount you spend on the phone each month		
You can prevent other people using your phone		
You already have access to a payphone or a friend's		
Telkom phone to make cheap calls		
Other (specify)		

4. We want to find out more about why you value the convenience and mobility of a cellphone. Please can you tick those reasons for wanting mobility that were important considerations for you. Of those that were important, please rank them from the most important to the least important (start at 1 for the most important).

	Important or not?	Rank
You spend a lot of time each day travelling		
You feel more secure with a phone on you outside the house		
You do not have a Telkom phone at work		
You have no privacy in the house to make calls		
You move home often (and don't want to pay or wait for a new Telkom phone each time)		
Other (specify)		

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5. If you could not get a Telkom phone installed, please indicate why not?

- Telkom does not install phones in your area
- You are not considered a creditworthy customer
- You were previously disconnected and still owe Telkom money
- There is already a Telkom phone on the property that you cannot use
- Other (please specify) _____

6. If you wanted to get a Telkom phone, how long would you expect to wait for Telkom to install the phone? _____

7. Did you previously have a Telkom phone? Yes No

If yes, why do you no longer have a Telkom phone? (Please tick the relevant reason)

- You were disconnected after not paying a bill?
- You voluntarily stopped the service
- You moved house to a place without a Telkom phone
- Other (please specify) _____

8. If you still owe Telkom money, how much do you owe them? R_____

9. How much did you pay for your cellphone and SIM card? R_____ (put zero if you got it for free)

10. Overall, do you think you are spending less or more on phone calls and connection fees in total per month by having a cellphone and not a Telkom phone?

- Less How much less per month? R_____
- More How much more per month? R_____



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Telkom phone owners

Please answer these questions if you have a Telkom phone (prepaid or not)

11. Please can you tick those reasons for choosing a Telkom phone rather than a cell-phone that were important considerations for you. Of those reasons that were important, please rank them from the most important to the least important (start at 1 for the most important).

	Important or not?	Rank
The cheaper rates for making phone calls		
You got a Telkom phone before cellphones were available and have not changed		
There was already a Telkom line in the house when you moved in		
It is cheaper for others to call you		
You could not afford the upfront costs of a cellphone and SIM card		
You need to connect a computer to the phone line		
Other (specify)		

12. If you have the prepaid Telkom phone, please can you tick those reasons for choosing the prepaid option that were important considerations for you. Of those reasons that were important, please rank them from the most important to the least important (start at 1 for the most important).

	Important or not?	Rank
The cheaper installation charge		
The cheaper monthly rental charge		
The ability to control who uses your phone		
The ability to control the amount you spend on phone calls per month		
You did not qualify for the conventional line		
Other(specity)		

13. Did you buy your own phone to connect to the Telkom line or did Telkom provide it when they installed the phone?

- Brought own phone How much did you pay? R_____
- Telkom provided phone

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14. How much would you expect to pay for a cellphone and SIM card? R_____

15. Overall, do you think you are spending less or more on phone calls and connection fees in total per month by having a Telkom phone and not a cellphone?

Less How much less per month? R_____

More How much more per month? R_____

Phone usage

16. Can you please tell us about the calls you make during an average week.

How many calls do you make per week	
How many minutes do you spend on each call	
How many of these calls are made in the evenings and on weekends	
How many of these calls are to cellphones	
How many of these calls are national calls (outside Cape Town)	
How many of these calls are made for free on a work or friend's phone?	
If you have a cellphone, how many SMSs do you make per week	
How many calls do you receive per week?	

17. On average, how much do you spend on phone calls and any monthly phone charges each month?

Cellphone R_____ Telkom phone R_____ Payphone R_____

18. Are there some months where you have less than R40 to spend on phone costs?

Yes No

Personal details

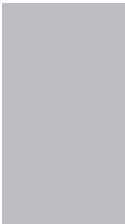
19. What area do you live in? _____

20. What sort of home do you live in?

Brick house Shack Flat Backyard room

Other _____

21. How long have you been in this house? _____ years



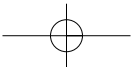
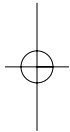
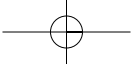
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22. How many people stay in the house? _____

23. What is your average monthly household income?

- | | | | | | |
|----------------|--------------------------|---------------|--------------------------|-----------------|--------------------------|
| Less than R500 | <input type="checkbox"/> | R500 - R999 | <input type="checkbox"/> | R1000 - R1499 | <input type="checkbox"/> |
| R1500 - R1999 | <input type="checkbox"/> | R2000 - R2499 | <input type="checkbox"/> | R2500 - R2999 | <input type="checkbox"/> |
| R3000 - R3499 | <input type="checkbox"/> | R3500 - R3999 | <input type="checkbox"/> | More than R4000 | <input type="checkbox"/> |

24. How long does it take you to walk to the nearest payphone or friend's phone that you can use? _____ minutes



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**EXTENDING TELECOMS OWNERSHIP IN
SOUTH AFRICA: POLICY, PERFORMANCE AND
FUTURE OPTIONS**

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Working Paper 7-2003

